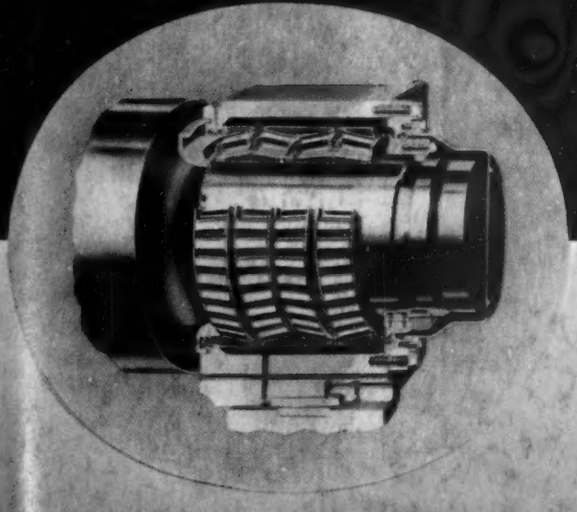
January 6, 1947

STEEL

The Magazine of Metalworking and Metalproducing

ESTABLISHED 1882

EDITORIAL INDEX, PAGE 141



Painted for The Timken Roller Bearing Company by Peter Helck

Timken "Balanced Proportion" Steel Mill Bearings for Precision, Production and Economy

. . . Show load ratings up to 40% higher than previous designs of tapered roller bearings, size for size, with 50% to 60% increase in neck strength, thereby assuring greater mill and bearing rigidity.

THE TIMKEN ROLLER BEARING COMPANY . CANTON 6, OHIO

ADD THIS PLANT TO YOURS IN 1947

THE HEALD MACHINE COMPANY is more than a machine tool manufacturer; it is a service organization for assisting industry in its many problems of how best to improve quality and cut costs.

Check with our Field Engineers

Perhaps you have a bothersome manufacturing problem on your new product, or wish to increase production and still improve the quality of your present goods. If so, any one of the 45 field engineers at our branch offices will be glad to study it over with you.

We can also offer you the services of our 150 engineers at Worcester. These men can turn to records covering 40 years of experience on precision finishing jobs the world over, and can offer suggestions and sketches to meet your most critical requirement.

Or visit us at Worcester

Put our plant to work for you. Call our nearest branch office, or better still make a personal visit to Worcester, where you can see for yourself our facilities for serving you. THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision
. . . less cost

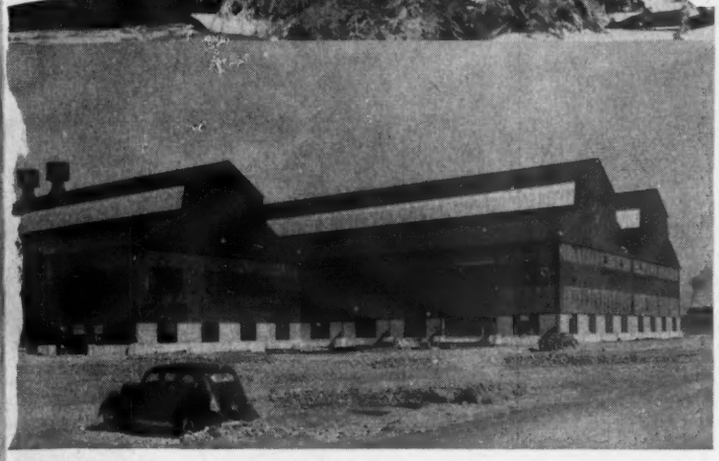
Branch Offices at Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

From the News of the Year

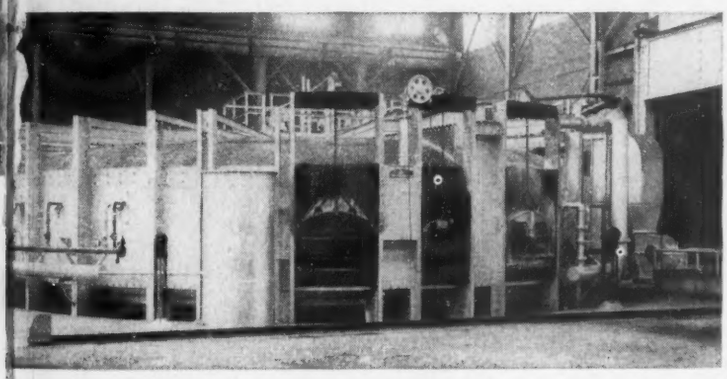
AT BETHLEHEM

SAFETY TROPHY—Last year Bethlehem's Johnstown, Pa., plant won first place among the twenty-five largest steel plants in the United States in the annual contest sponsored by the National Safety Council. On October 16 plant general manager R. E. Hough received the trophy from Theodore F. Smith, Chairman of the Board of Directors of the Council.



BAR MILL—The year just ended saw the new 10-in. bar mill at the Lackawanna, N. Y., plant well on the way toward completion. This new unit is expected to be in production around the middle of 1947. Two of the buildings that will house the new mill are shown here.

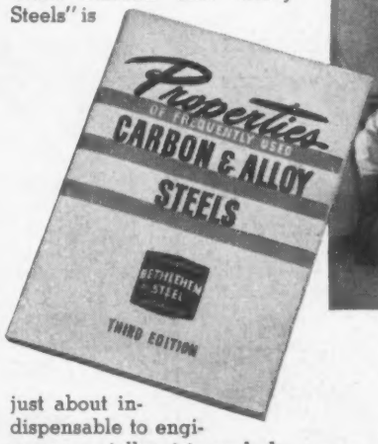
COLD-REDUCING MILL—Construction of new facilities for production of flat-rolled steel at Sparrows Point, Md., was well advanced as the year ended. Here is the new 56-in. tandem cold-reducing unit as it looked in mid-November. Construction projects in Bethlehem's program at Sparrows Point also include a new 68-in. hot-strip mill.



NEW AXLE PLANT—Our new axle plant at Johnstown, Pa., has now been running for several months. This 50-ft diameter heating furnace, part of the equipment, is of the rotary-hearth type. It has latest automatic devices for controlling temperature and furnace atmosphere.

MILLION VOLT X-RAY (*right*)—Inspection for quality control with X-Ray equipment operating at 1,000,000 volts was introduced by Bethlehem during 1946. This advanced technique brings to light internal flaws in castings up to 7 in. in wall thickness.

LATEST DATA ON TODAY'S STEELS!—Published October 15, this Third Edition of our "Properties of Frequently Used Carbon and Alloy Steels" is just about indispensable to engineers, metallurgists and designers. It contains vital information about today's steels, including properties charts based on thousands of tests by Bethlehem metallurgists.



TO SERVE TOOL STEEL USERS AND DISTRIBUTORS—Early part of the new year will see completion of this warehouse at the Bethlehem, Pa., plant where large tool steel stocks will be maintained for better, speedier service to distributors and users.

BETHLEHEM STEEL

Kirsten

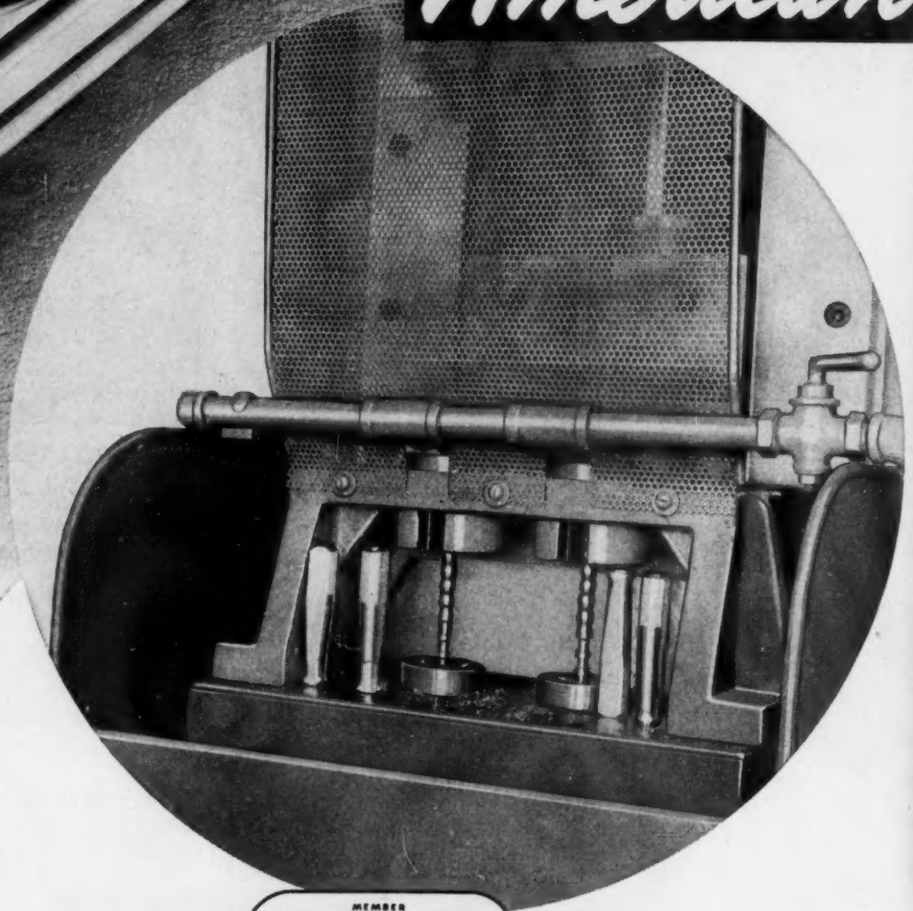
BROACHED BY ★ American

Accuracy and smooth finish are required for the holes in Kirsten pipe radiators and cigarette holder bodies. Close tolerances are needed to fit the arbor for subsequent milling operations on the stem exteriors. Smooth finish is likewise important on inner bores. All these specifications—*plus* an extremely high rate of production—are met in broaching by *American*.

Kirsten master mechanics use the popular *American* T-4 type Broaching Machine, one more example of the many ways in which broaching by *American* can be applied to a wide range of metal working problems.

FOR ALL YOUR BROACHING NEEDS
—Machines, Tools, and Engineering—

See American First—



MEMBER BROACHING TOOL INSTITUTE

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BROACHING MACHINES
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BROACHING TOOLS
SPECIAL MACHINERY

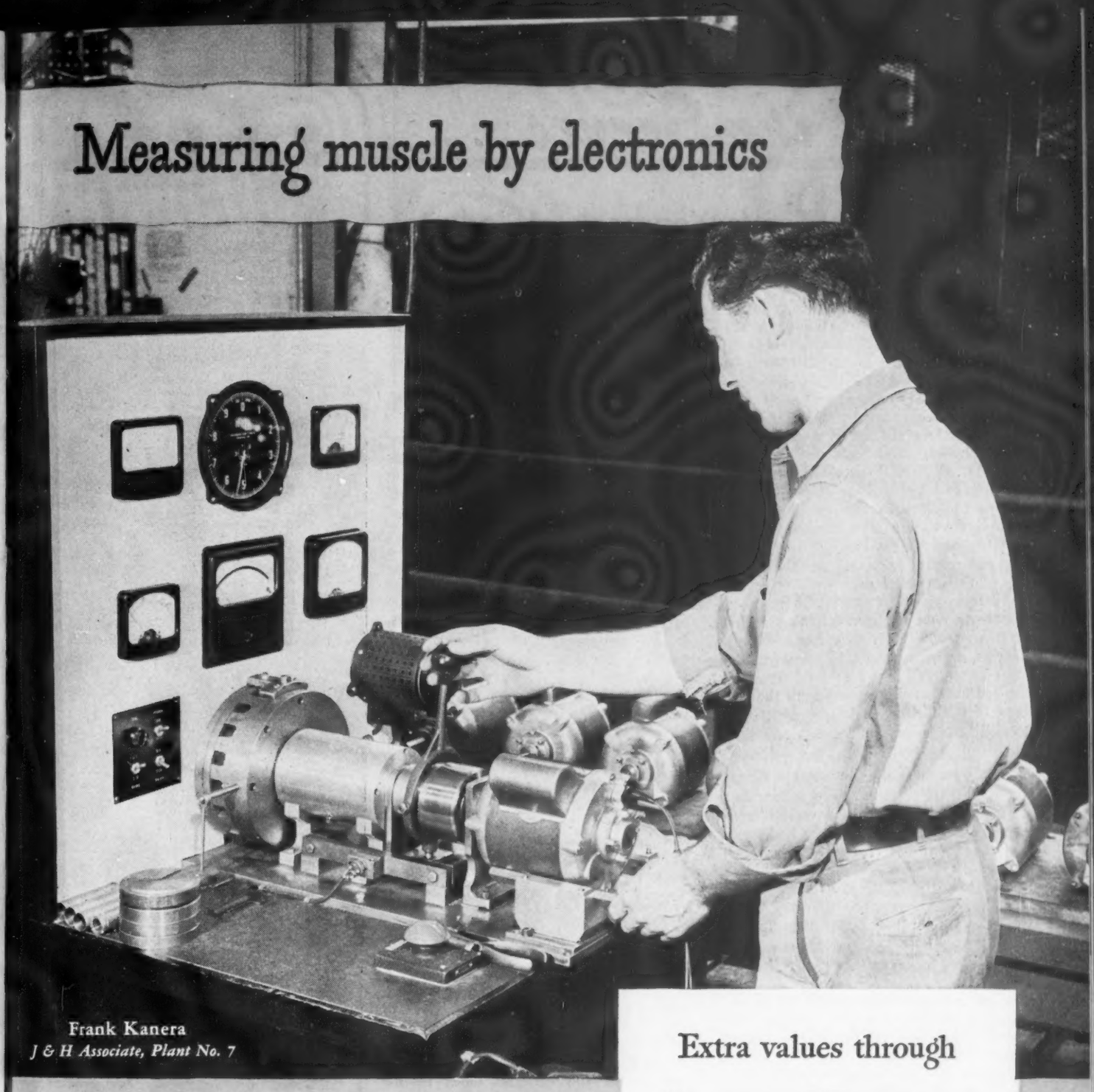
DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

Illustration shows *American* Hydraulic T-4-24 Broaching Machine tooled for broaching cigarette holders and pipe radiator stems.

Two parts are loaded into fixture and the broaches lowered, by means of a special hydraulic retriever unit, thru the parts till the shank ends connect to the pull heads. The main hydraulic machine slide then pulls broaches thru parts—operator removes parts, slide is then reversed to bring broaches up to retriever unit which hydraulically raises to extreme up position ending one complete cycle.

As operator's only function is to insert and remove parts and operate machine levers, production is high—250 pieces per hour. Tolerance is held to .001.

Measuring muscle by electronics



Frank Kanera
J & H Associate, Plant No. 7

Extra values through

JACK & HEINTZ

Mass Precision

The usual way to measure the torque of electric motors is to use an apparatus of wheels, brakes and weighing scales. This method was too slow and cumbersome for the new Jack & Heintz Fractional Horsepower Motor Plant. So Jack & Heintz Production Engineers developed an ingenious electronic dynamometer which measures motor torques *in a few seconds* with unheard-of precision. An operator simply plugs in the motor and reads the torque on a dial. This helps speed up the production of Jack & Heintz motors for urgently needed appliances.

This is typical of the achievements of Jack & Heintz *mass precision* which are producing extra values in motors, refrigeration compressors, aircraft accessories, Eisemann magnetos and bearings *today*, and which promise startling developments for *tomorrow*.

JACK & HEINTZ PRECISION INDUSTRIES, INC., *Cleveland 1, Ohio*

Behind the Scenes...

Jan. 6, 1947—STEEL's Yearbook of Industry

Well, here it is. It's quite a baby, as you will agree after you have had a chance to run a few hundred pages to the right of this column. You'll be agreeing with our editors, who have unanimously pronounced this the finest job they have ever produced. You'll be appreciating, we hope, all the hours of sweat and strain they have spent in assembling the tremendous amount of material submitted by experts in all lines of metalworking. You will also, no doubt, be pleased and amazed at the facts and figures contained in the special 32-page section devoted to the review of 1946 and the outlook for 1947. Here in this 32-page section is crystallized the thinking of thousands of metalworking executives from coast to coast who supplied information on the questionnaires which were sent out by STEEL's research staff. It was a tremendous job, requiring the cooperation of our combined research and editorial staffs, experts from the Bureau of the Census in Washington, services of the International Business Machines Co.'s Cleveland offices, and the rush work of our own art staff plus outside typographers and printers. The effort has taken several months, and we'd like to throw out a few orchids here and there to some of the key figures who have made this job an outstanding contribution to the industry's store of useful information.

One of them should be Bill Kellogg of our art department, whose almost superhuman job of laying out the whole 32 pages has resulted in one of the most attractive features ever to run in STEEL. He had about two weeks to design the whole thing, and we think he's overdue for a little credit on it. The overall direction of the job fell to Editor Irwin Such, whose guidance and interpretation of the facts and figures is evident on every page. Associate Editor Walt Campbell is responsible for the job of writing the copy which makes the figures come to life and mean more to you readers. STEEL's research staff, under the direction of Jim Zuber and Bob Hartford, was responsible for the collection of the figures from the thousands of plants that participated, and assembly of these figures into usable form. Nobody has been brave enough to figure out the number of separate calculations required to provide the final figures, which look so simple in their well-presented form, but it is safe to say that they run into the hundreds of thousands. All these figures had to be checked and rechecked for accuracy, and the final figures on production and employment, which are the keystones of the entire study, had to be checked with the Bureau of the Census to be sure that the astronomical totals which may prove unbelievable to some of you—as they did to us when first we saw them—were actually on the beam—and represented fairly what has happened in this amazing postwar period.

We can't forget to toss orchids in the direction of Brad Wilkin and his engineering staff for the immensely valuable section of comments on new technical developments, which you'll find all neatly dressed up by Art Editor Don Cadot and carefully classified by subjects—a compendium in capsule form of all the new things which happened in 1946 and many previews of interesting things to come in 1947. In many ways, this is one of the most valuable reference works available on the new technical developments in the industry served by STEEL—we will recommend that all metalworking executives take ample time to check over all the sections having any bearing on the operations performed in their plants, because the experts who are commenting in this technical section represent the cream of the metalworking industry—men whose opinions on current developments are sound because they know at first-hand what's going on. You'll find some new sections here, which haven't appeared in previous yearbook issues.

Although we have been going on at a great rate from the beginning of this stint about the editorial effort, and we'll admit that we're bowled over by the scope and importance of the job, we don't want to slight the advertisers. The advertising index in the back of this book is probably as important to you readers as the editorial index in the front. There's much important information in STEEL's advertising pages. We wish we had enough space here to point out some of the outstanding jobs which industrial advertisers are doing on behalf of the users of their products through their advertising pages. We have to stop somewhere, though, and this seems to be it. Next week, with the stars out of our eyes and the stardust gone from our hair, we'll be back on the same old line, talking over the back fence in the usual way, but with one good new year's resolution intact—*no more coconut problems!*

Shrdlu

(Editorial Index—page 141)

STEEL
Vol. 118—No. 1 January 6, 1947

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Blanking
Forming
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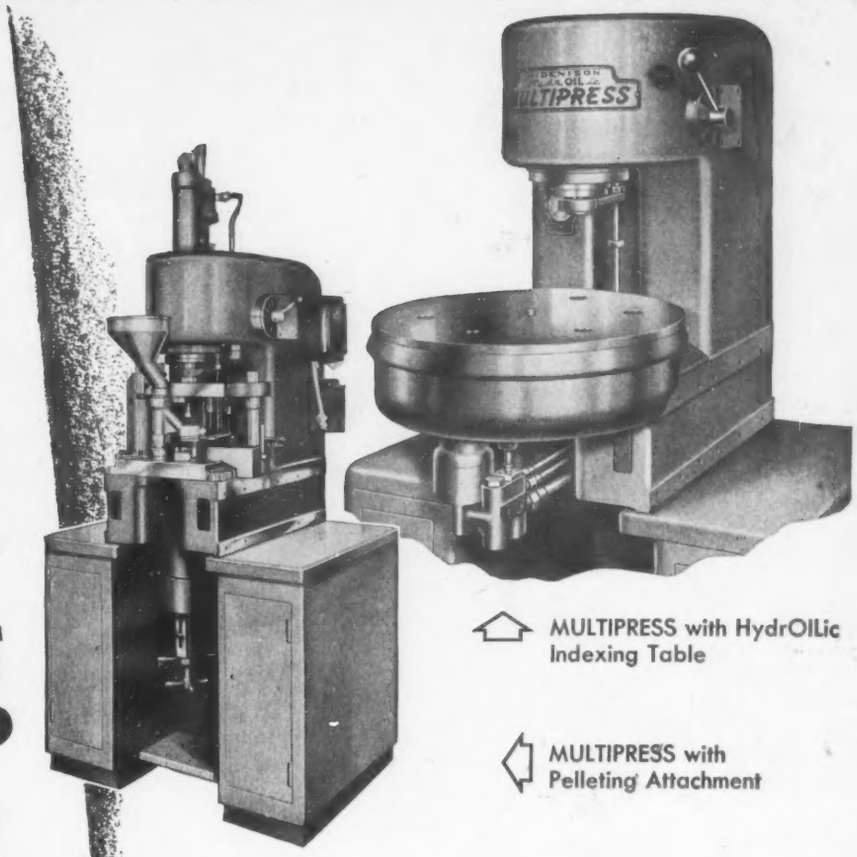
Shearing
Marking
Assembling
with MULTIPRESS



MULTIPRESS with HydrOILic Indexing Table

MULTIPRESS with Pelleting Attachment

Basic 4-Ton MULTIPRESS
(Also 6 & 8 ton capacities)

On scores of jobs like these—and many others—MULTIPRESS users continue to report higher production, increased efficiency and better results.

The reason: remarkable operating flexibility has been built into the highly compact, fully self-contained *basic* MULTIPRESS—and its flexibility has been further multiplied by an unusually wide range of standard MULTIPRESS controls, toolings and accessories.

In addition, Denison research engineers work constantly to find better ways to apply MULTIPRESS advantages to specific operations of every kind.

MULTIPRESS offers a choice of 4, 6, or 8-ton units . . . seven different models . . . manual or automatic controls . . . accessory benches, work-table extensions, side shelves and bolster plates . . . attachments for indexing, pelleting, foil marking, etc. . . . toolings for almost any need. Write for full details. The Denison Engineering Company, 1163 Dublin Road, Columbus 16, Ohio.

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DENISON EQUIPMENT in APPLIED HydrOILics

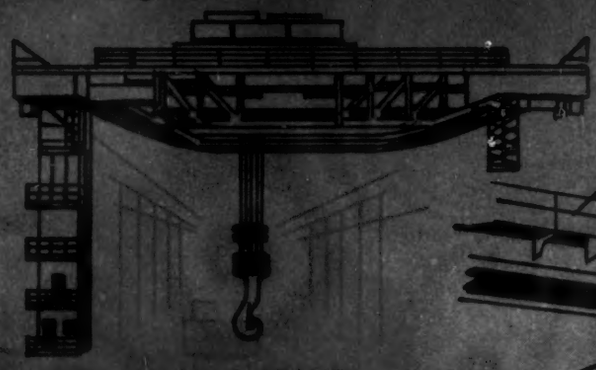
World's Largest Builder of the World's Largest Cranes

Alliance

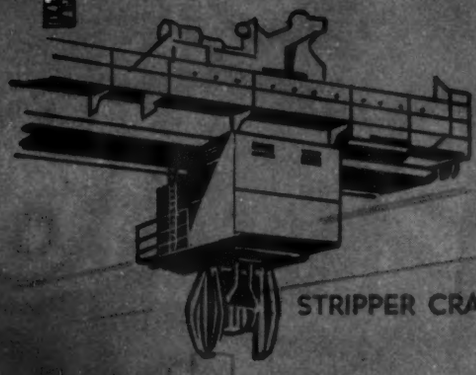
Alliance makes the equipment to move slabs, ingots, hot metal, raw material and finished products safely, quickly, and easily.

For 50-odd years, Alliance has been known as The World's Largest Builders of the World's Largest Cranes.

GANTRY CRANE



LADLE CRANE



STRIPPER CRANE

SOAKING PIT CRANE

OPEN HEARTH CHARGING MACHINE

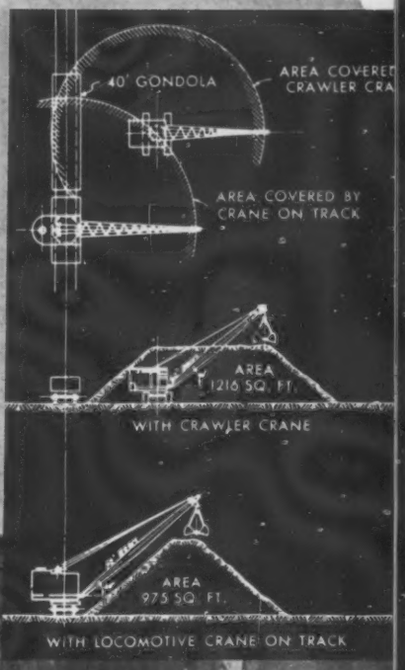
FORGING MANIPULATORS

SLAB AND BILLET CHARGING MACHINE

THE ALLIANCE MACHINE COMPANY

ALLIANCE, OHIO · 1622 OLIVER BLDG., PITTSBURGH, PA.

Storeyard area is MONEY!



LOOK at these diagrams. Here's a comparison that shows how a Northwest Crawler Crane can improve your Storeyard handling problem. The Northwest will give you a materially larger coverage than a locomotive crane. It gets the maximum value out of your storage space.

Your Northwest is not confined to tracks. It will make the far corners of the yard usable. It will handle any type of load. It will travel from one part of the yard to another with a load. It does things no other type of material handling equipment can do and in doing them it brings you truck dependability and low cost operation.

The Northwest Crane fits itself into expansion plans without a dollar of cost for additional equipment. Plan now to cut material handling costs. Northwest brings you features for easier, lower cost operation that are found in no other similar equipment. We'll be glad to furnish details.

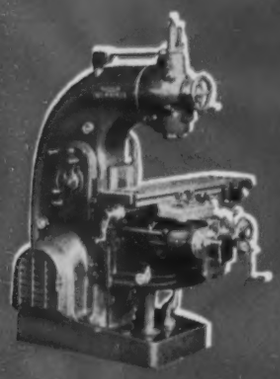
NORTHWEST ENGINEERING COMPANY
1805 Steger Building, 28 East Jackson Boulevard, Chicago 4, Ill.

NORTHWEST

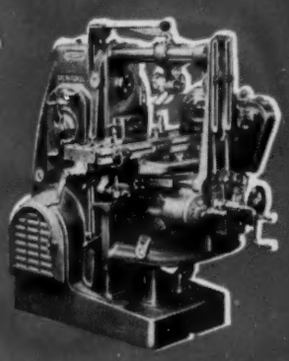
The Crane that goes Anywhere!

4 to 44 tons

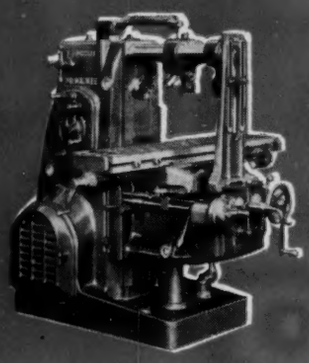
Big Choice Gives



MODEL 1H Swivel Head Vertical —Also available in Plain, Universal, Automatic Cycle Plain and 18" Manufacturing types.

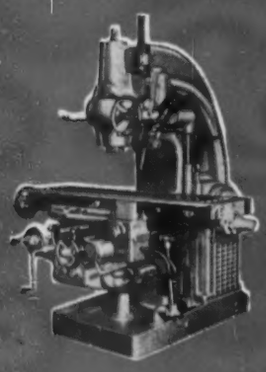


MODEL 2HL Universal — Also available in Plain and Swivel Head Vertical types and in Automatic Cycle Plain type.



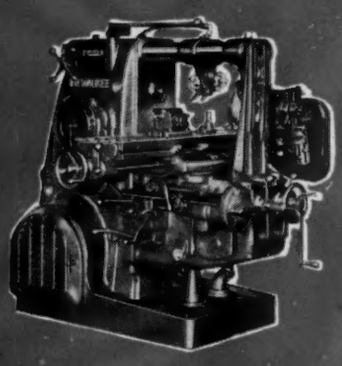
MODEL 2H Plain—Also available in Universal and Vertical types and in Automatic Cycle Plain and Vertical types.

MODEL 3H Universal—Also available in Plain and Vertical types and in Automatic Cycle Plain and Vertical types.

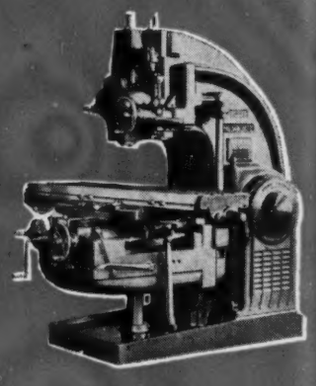


MODEL 2K Vertical Automatic Cycle—Also available in Plain and Vertical types and in Automatic Cycle Plain type.

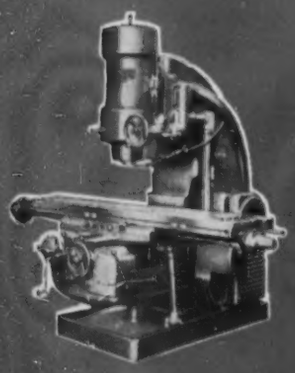
MODEL 3KM Plain—Also available in Universal and Vertical types and in Automatic Cycle Plain and Vertical types.



MODEL 3K Universal—Also available in Plain and Vertical types and in Automatic Cycle Plain and Vertical types.



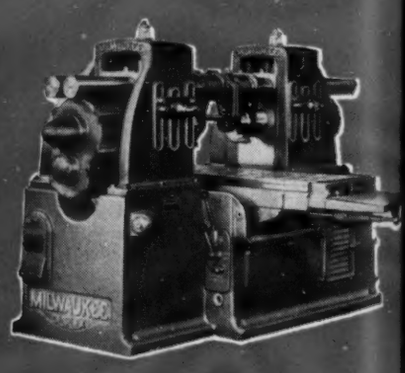
MODEL 4K Vertical—Also available in Plain and Universal types and in Automatic Cycle Plain and Vertical types.



MODEL 50 CSM Vertical — Also available: Plain and Automatic Cycle Plain and Vertical types. Choice of 2 working ranges.

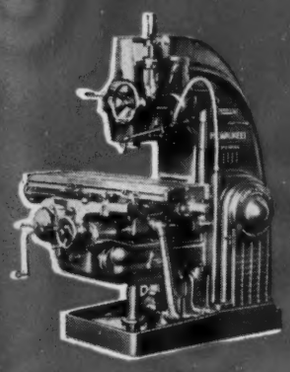
MODEL M-24 Simplex—Available with 18" - 24" or 30" longitudinal travel to table — in Simplex models only.

MODEL 1200 Simplex—Available in both Simplex and Duplex models with 24" - 36" or 48" longitudinal travel to table.

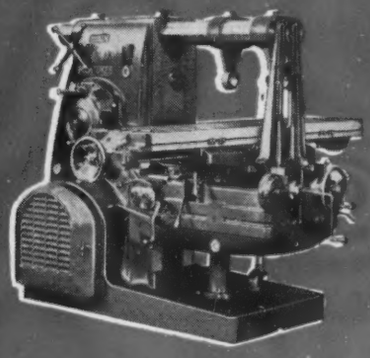


MODEL 1800 Duplex—Available in both Duplex and Simplex models. Choice of 24" - 36" - 48" or 54" longitudinal travel to table.

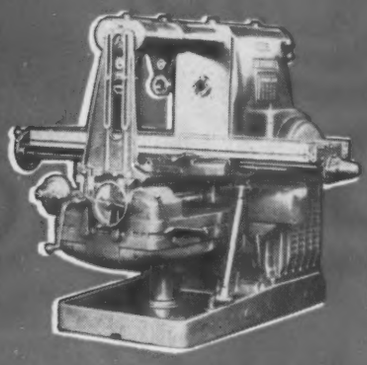
You Better Buy!



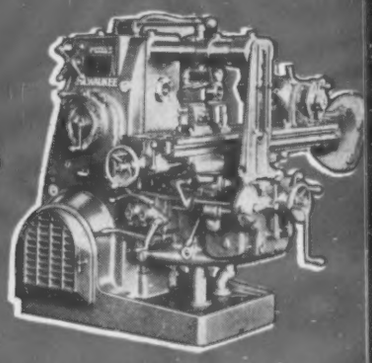
MODEL 4H Vertical—Also available in Plain and Universal types and in Automatic Cycle Plain and Vertical types.



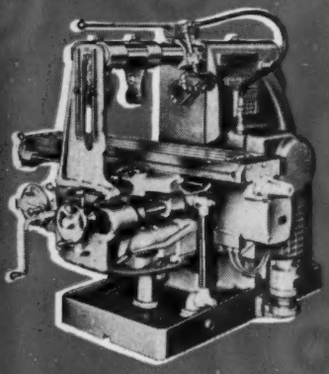
MODEL 5H Plain—Also available in Universal and Vertical types and in Automatic Cycle Plain and Vertical types.



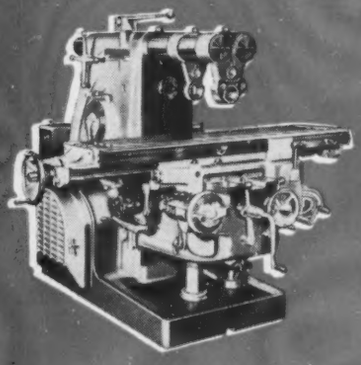
MODEL 5HM Plain—Also available in a Vertical Model machine with identical working ranges as the Plain model.



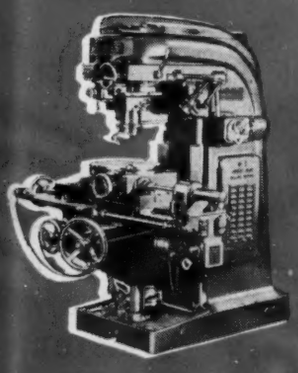
MODEL 2KM Universal — Also available in Plain and Vertical types and in Automatic Cycle Plain and Vertical types.



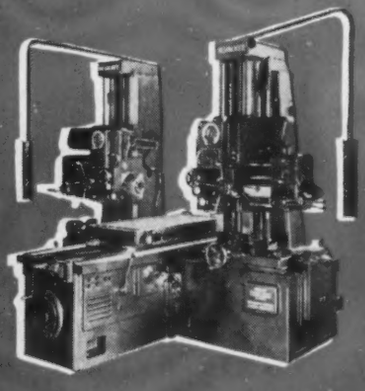
MODEL 20 CSM Plain—Also available in Vertical and Automatic Cycle Plain and Vertical types. Choice of 2 working ranges.



MODEL 30 CSM Plain Automatic Cycle—Also available: Plain, Vertical and Automatic Cycle Vertical types. Choice of 2 working ranges.



MODEL 2D Rotary Head Milling Machine.—One size and working range only. Especially suited to precision tool and die work.



MODEL No. 3TT Precision Milling and Boring Machine—Also available in single column and headstock model — No. 3T.

Kearney & Trecker

Milwaukee Milling Machines — 99 Different Models, Sizes and Types mean the right machine for your job

There's a Kearney & Trecker for every milling job — in small shops, high production plants or precision tool rooms. Horsepowers range from 3 to 50 with wide working ranges and broad feed and speed ranges to suit.

Model K machines are general all-purpose machines. Model H machines are the intermediate type. The new CSMs are the most powerful standard milling machines ever built — specifically designed for carbide milling of steel, but suited for all-purpose work as well. For high speed production you can get the Manufacturing types in conventional, Simplex and Duplex models.

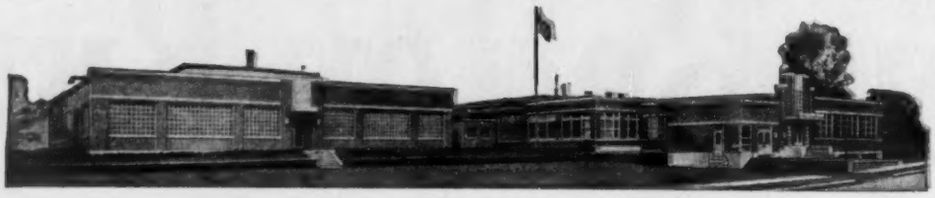
You'll find the Rotary Head Milling Machine and Models No. 3T and 3TT Precision Milling and Boring Machines are ideal for the specialized shop. To meet unusual or special machine requirements, there's Kearney & Trecker Customer Engineering Service where you get the benefit of nearly fifty years experience in precision and production machine tool design and manufacture.

Catalog E-53 gives you complete data on our entire line — Write for it! Please indicate your business connection.

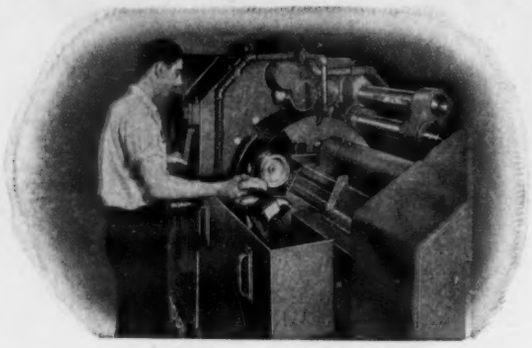
KEARNEY & TRECKER
CORPORATION
Milwaukee 14, Wisconsin

474

If you visit the Wico Electric plant



they will probably point out this machine



This progressive manufacturer, ever alert to increasing manufacturing efficiency, sought a better way to machine a rather large and "difficult" magneto housing. There are three different materials in the piece—aluminum die casting, steel bushing and liner, and brass spacer. The tapered hole in the bushing requires a fine finish and close tolerance. The inside diameter of the liners must also be closely maintained.

The housing was formerly turned out on four turret lathes at the rate of 28.8 per hour. New Britain engineers proposed replacing these four lathes with a single Model 695 New Britain chucking machine. Here are the results:

Regular production rate over a six-month period — 102 pieces per hour. Uniformity and over-all quality substantially improved. Cost per piece reduced from 55¢ to 12.8¢. Operator fatigue practically eliminated. Wico management reports that the new machine will pay for itself in less than two years, and completely meets every requirement on this "difficult" piece.

Since the earliest days of automatic machines, the ability of New Britains to reduce production costs and provide a foundation for increased employment has been an important factor in the growth of American manufacturing. This ability, as well as the range of work New Britain automatics can perform, is constantly being expanded by New Britain engineering and research. Why not check over *your* work with the New Britain sales engineer in your locality.

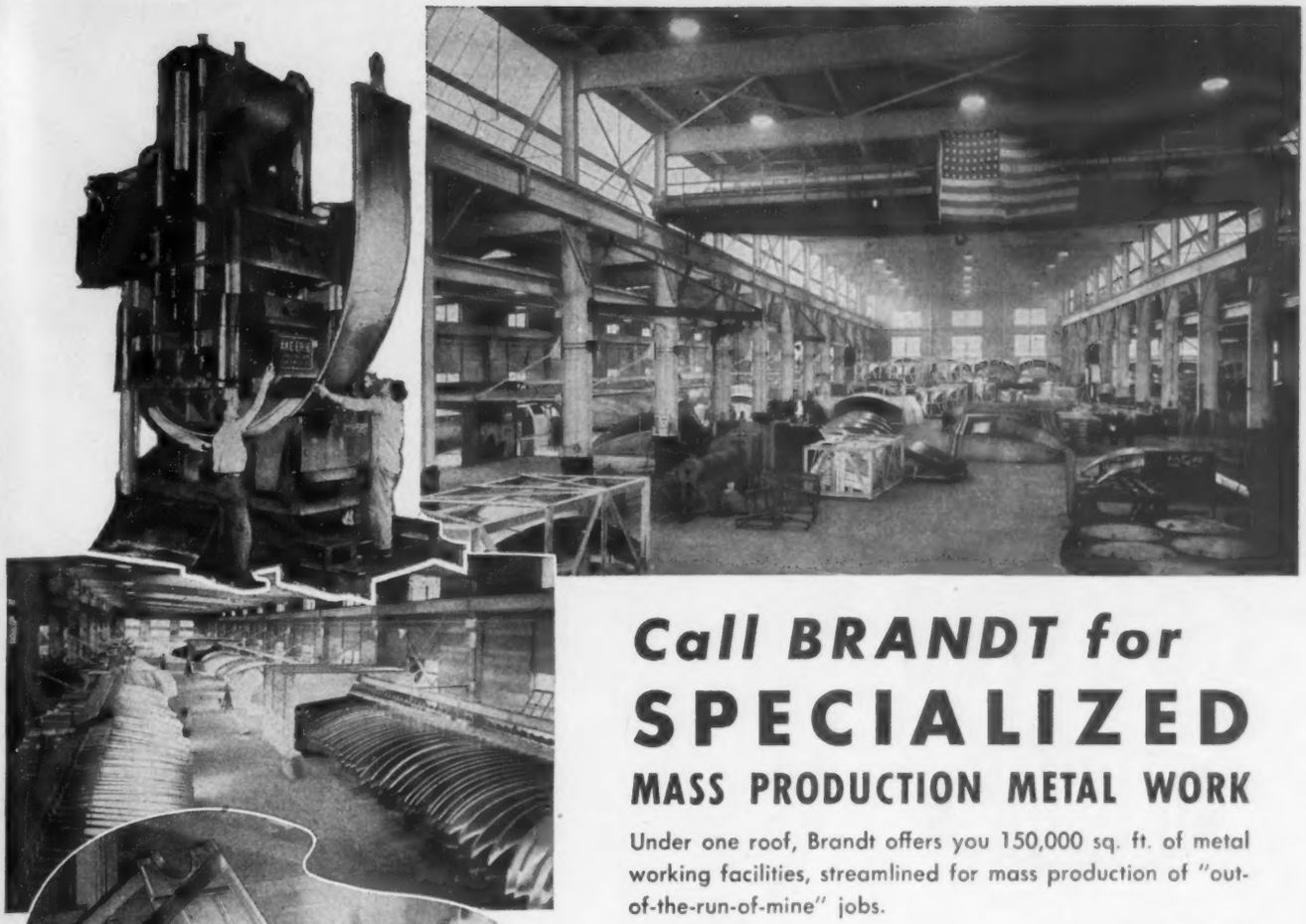
ENGINEERING DETAILS

Fourteen tools are fed in by the main tool slide, and the fact that three different metals are cut at the same time makes the production rate outstanding. To produce the fine finish and close tolerance of the taper bushing hole, two boring, one counter-boring and two taper reaming operations are performed. Two roughing cuts and one finish operation are employed to assure high uniformity and good finish in machining the segment inserts.

LOWER COSTS . . .
KEY TO MORE SALES AND FULL EMPLOYMENT

New Britain

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT



Call BRANDT for
SPECIALIZED
MASS PRODUCTION METAL WORK

Under one roof, Brandt offers you 150,000 sq. ft. of metal working facilities, streamlined for mass production of "out-of-the-run-of-mine" jobs.

STAMPINGS **FORMING**
HEAVY WELDMENTS

Spot Welded Assemblies **Plate Fabrication**
Crating & Shipping Facilities **Complete Assemblies**

★ ★ ★ ★

MILD STEEL **STAINLESS STEEL**
ARMOR PLATE
SHEET METAL
ALUMINUM **MAGNESIUM**
NON-FERROUS METALS

Proximity to steel mills and to both rail and water transportation assures prompt delivery. If you have a Specialized metal production problem . . . Call BRANDT.

ALL UNDER ONE ROOF

BRANDT
BALTIMORE

CHARLES T. BRANDT, INC., 1700 RIDGELY ST., BALTIMORE-30, MD.

Precision METAL CRAFTSMEN SINCE 1890 ★ ★ ★ ★

IT'S THE KNURLING THAT COUNTS

UNBRAKO

Reg. U. S. Pat. Off.

"Unbrako" Self-Locking Socket Set Screw with the KNURLED point

It's the knurled point of the "Unbrako" Socket Set Screw that digs in and holds tight—regardless of the most chattering vibration. Yet, it can be backed-out and used over and over again. There are millions of these dependable "Unbrako" Self-locking Socket Set Screws with the knurled cup point in use in industry. **"Unbrako" and "Hallowell" products are sold entirely through distributors.**

Pat'd. & Pats. Pend.

Knurling of Socket Screws originated with "Unbrako" in 1934.

You can't screw socket screws in or out, without a hex socket wrench,—so why not get our No. 25 or No. 50 "Hallowell" Hollow Handle Key Kit which contains most all hex bits. Kits: Pats. Pend.

"Unbrako" Knurled Socket Head Cap Screw

The "Unbrako" Knurled Socket Head Cap Screw has the knurling around the head—right where it gives even the most oily fingers a real slip and fumble-proof grip. This knurling makes it possible to screw the "Unbrako" Head Cap Screw in farther and faster before a wrench is used,—a real time and money saver where production is all important.

The "Unbrako" Catalog contains complete information about the many types of Screw Products carrying the famous "Unbrako" name—get your copy and keep it handy.

OVER 43 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 579 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

DOWN TIME can knock out your profits!

FIGHT costly down time on your metal working machines with Cimcool—the amazing new chemical emulsion. It incorporates an entirely new principle in cutting fluids . . . reduces down time in three definite ways.

1. Cimcool increases tool life. Its chemical lubricity reduces the heat from friction; and it absorbs what heat there is faster through a unique physical change in the coolant itself. Cimcool actually keeps tools and chips cool to the touch. Increased tool and wheel life results—50 per cent—100 per cent—even 200 per cent*.

2. Cimcool's low surface tension allows rapid settling out of chips and grit—means clean pump and supply lines.

3. Cimcool is not subject to rancidity, thus permitting fewer changes of cutting fluid.

CIMCOOL Solves MANY Problems

- Faster cooling allows faster cutting.
- Uniform work temperature (increases accuracy).
- No fire hazard—No smoke—No slippery film.
- Non-irritating—Doesn't grow rancid.
- Contains long-lasting rust inhibitor.
- Covers 85% of all metal working jobs.

*We'll gladly show you letters supporting this statement.

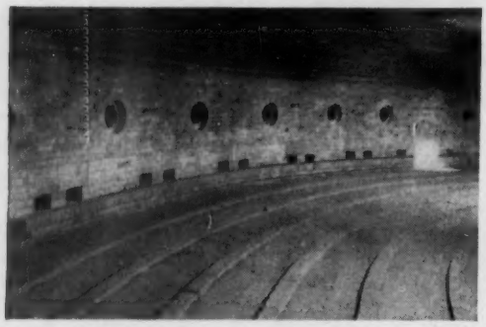
CIMCOOL

THE MULTI-PURPOSE CUTTING FLUID

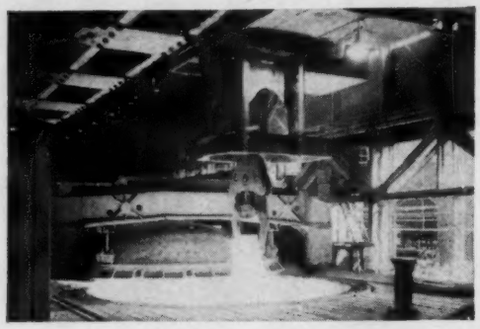
Trade Mark Reg. U. S. Pat. Off.

CIMCOOL DIVISION of THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO, U. S. A.

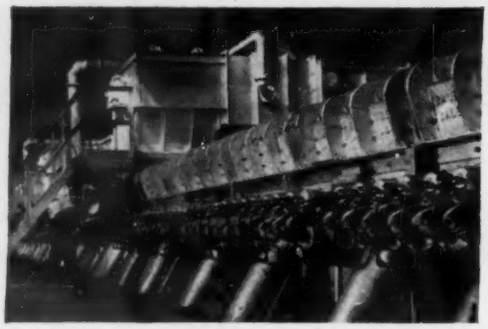
WHAT SALEM DOES IN THE METAL WORKING INDUSTRIES



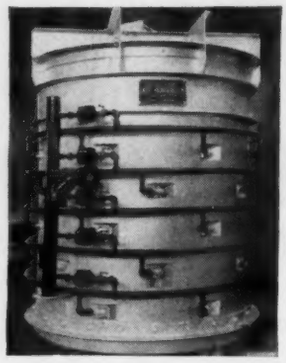
Salem Rotary Hearth furnaces are used for heating steel and copper for seamless tube mills and merchant mills . . . for heating copper billets for wire mills and ingots for making wheels . . . and for annealing fish plates.



Salem Circular Pits are used for heating all types of ingots . . . fired by natural gas, coke oven gas, combinations of blast furnace and coke oven gases, and coke oven gas and oil.



All the butt-weld furnaces in the United States and Canada **have been built by Salem.**



This hood type annealing furnace, **made by Salem Engineering Company,** is used by ferrous and non-ferrous industries . . . electric or gas fired.

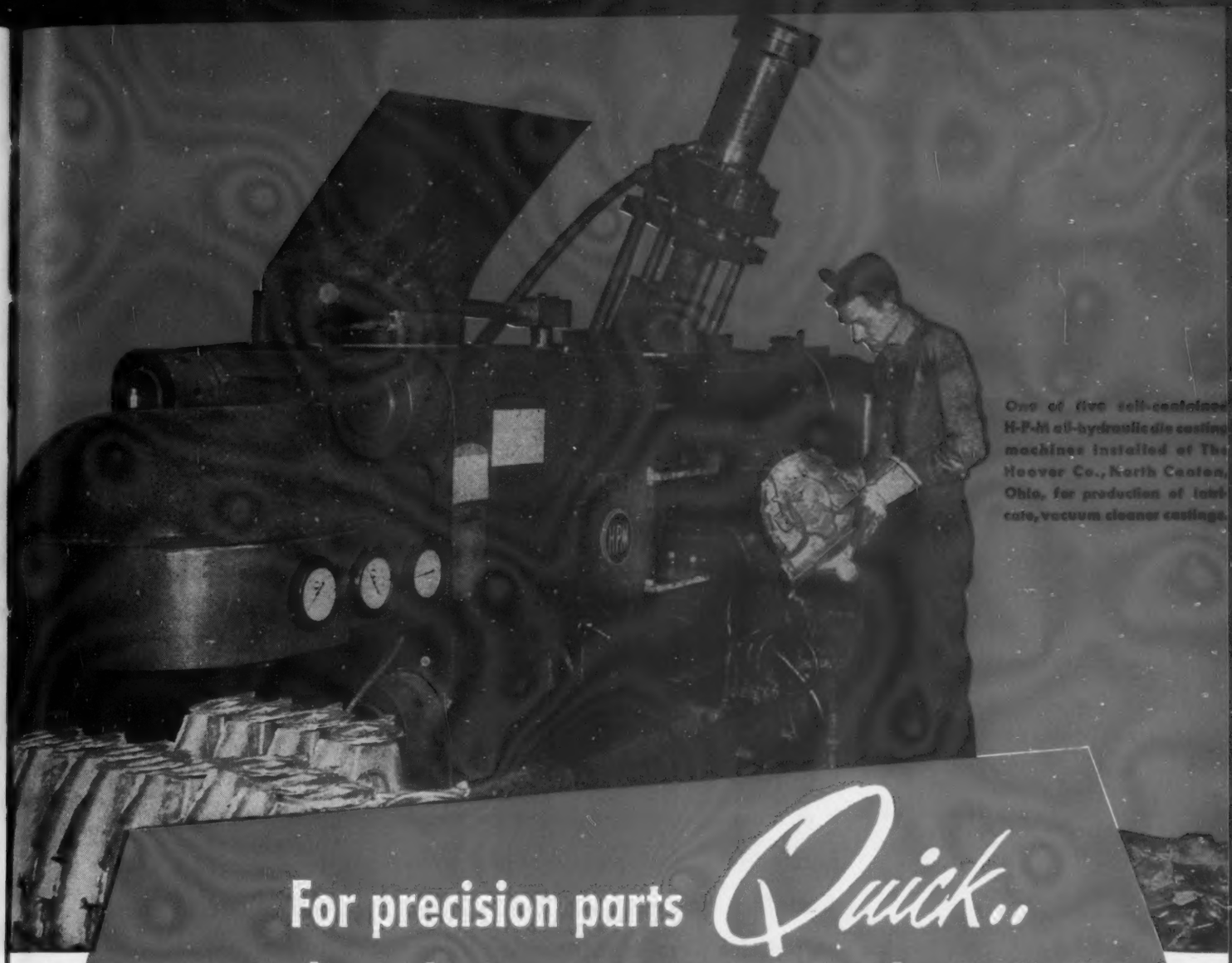
Salem Builds

CIRCULAR SOAKING PITS
ROTARY HEARTH FURNACES
CONTINUOUS BUTT-WELD FURNACES
CAR BOTTOM FURNACES
FORGE FURNACES
HEAT TREATING FURNACES
NEEDLE METALLIC RECUPERATORS
AIR RECIRCULATING FURNACES
GAS ATMOSPHERE FURNACES
MECHANICAL EQUIPMENT FOR CHARGING AND DISCHARGING MATERIAL FROM FURNACES

Steel Plant Engineers

SALEM ENGINEERING COMPANY

TORONTO, ONTARIO, CANADA — SALEM, OHIO — LONDON, ENGLAND



One of five self-contained H-P-M all-hydraulic die casting machines installed at The Hoover Co., North Canton, Ohio, for production of intricate, vacuum cleaner castings.

For precision parts *Quick*.. use modern *die casting* equipment by H-P-M

Is short metal supply slowing up your production? Are you looking for a way to make your product better, lighter—at lower cost?

Here's a way to do it—by nonferrous design. As the installation picture shows, The Hoover Co. uses large, intricate die castings, precision-produced on H-P-M *All-Hydraulic* High-Pressure Die Casting Machines.

The secret of successful production on large parts like these is the big, rugged, straight-line hydraulic die clamp, *an exclusive H-P-M design feature.* This outstanding development permits confining the pressure to the die cavities. There's less flash—and castings are more uniform. Automatic slowdown prevents die slam and results in less die wear and breakage. Also, there's automatic cycle control, hydraulic core pulls and hydraulic automatic ejection. These all add up to less operator fatigue, resulting in higher production output. With H-P-M you'll have less down-time for repairs—and less spoilage.

If our standard machines don't fit your die casting requirements, we can build production units to your specifications. May we talk it over?

For an authoritative, unbiased, twelve-page manual describing die casting materials and methods, write us for a copy of reprint manual No. 10.

THE HYDRAULIC PRESS MANUFACTURING CO. Mount Gilead, Ohio, U. S. A.

Branch Offices: New York, Philadelphia, Cincinnati, Cleveland, Detroit and Chicago. Representatives in other principal cities

HPM

All-Hydraulic Self-Contained **Die Casting Machines**

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

. . . THE BEST BUY

The fact that Whitcomb has been building locomotives for over 40 years is of little significance unless the accomplishments during the years have made definite contributions toward more modern, more economical means of transportation. The many "firsts" credited to Whitcomb during this period—first successful gasoline mechanical locomotive, first explosion proof electric mine model to receive the endorsement of the U. S. Bureau of Mines, these and many other outstanding "firsts" are tributes to Whitcomb designers and engineers as well as to the facilities of a modern plant and progressive manufacturing methods.

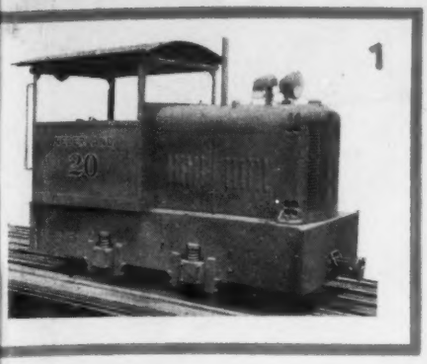
But the position of any concern in relation to others in the same field seldom remains constant. Many factors determine whether it is moving steadily forward or slipping back, not the least important is that concern's ability to quickly recognize the ever changing conditions and trends within the industry and to alter its policies to meet these changes.

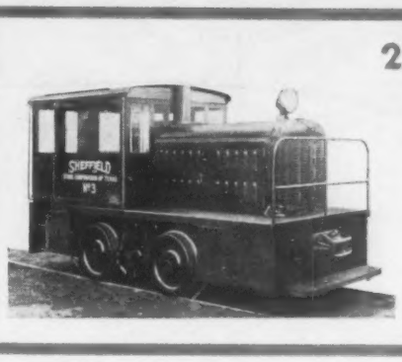
Whitcomb has for 40 years successfully defended its position in the locomotive field, mainly because of its determination to keep on building the best locomotives that can be produced at prices that are commensurate with the quality and performance of the product itself.

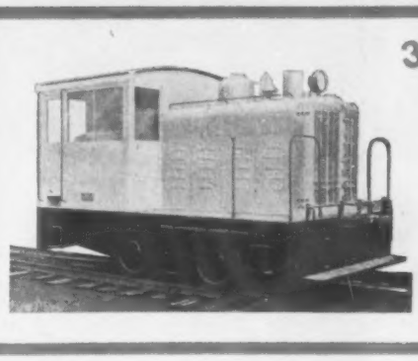
THE WHITCOMB LOCOMOTIVE CO.
ROCHELLE, ILLINOIS
Subsidiary of The Baldwin Locomotive Works

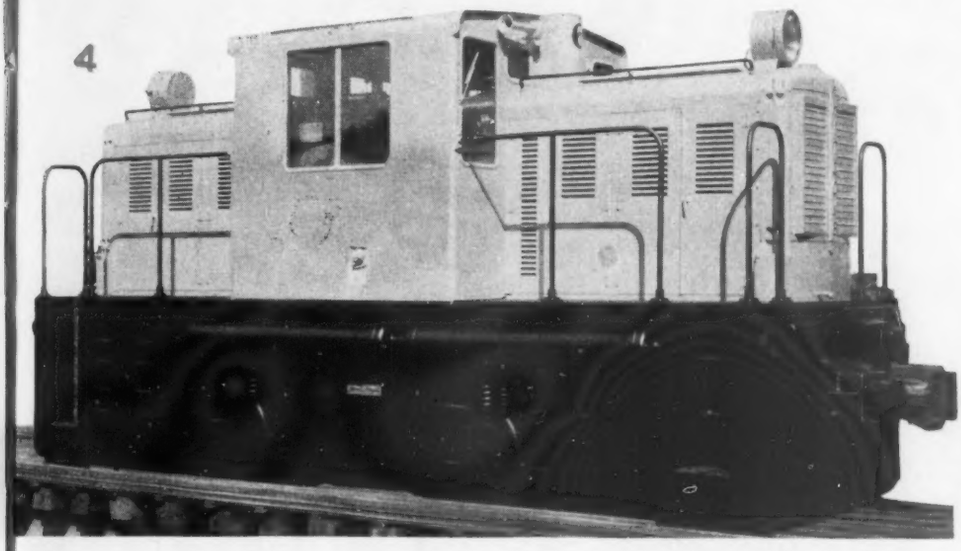
FROM 3 TO 95 TONS

Y IN LOCOMOTIVES









1

5-TON DIESEL MECHANICAL

39 H.P. or 47 H.P. Gauges 20″ to 42″. Maximum T.E. 25% adhesion, 2,500 lbs. in low gear.

2

10-TON DIESEL MECHANICAL

98 H.P. or 104 H.P. Gauges 23-5/8″ & up. Maximum T.E. 25% adhesion, 5000 lbs. in low gear.

3

20-TON DIESEL MECHANICAL

150 H.P. Gauges 30″ and up. Maximum T.E. at 25% adhesion 10,000 lbs. in low gear

4

50-TON DIESEL ELECTRIC

300 H.P. Gauges 36″ and up. Maximum T.E. at 25% adhesion 25,000 lbs.

5

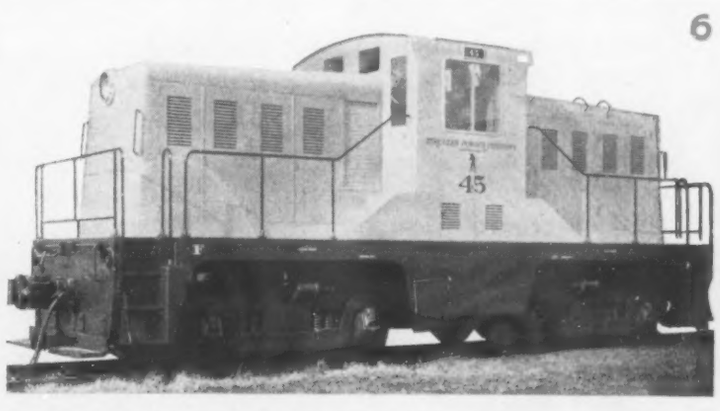
35-TON DIESEL ELECTRIC

200 H.P. Gauges 30″ and up. Maximum T.E. at 25% adhesion 17,500 lbs.

6

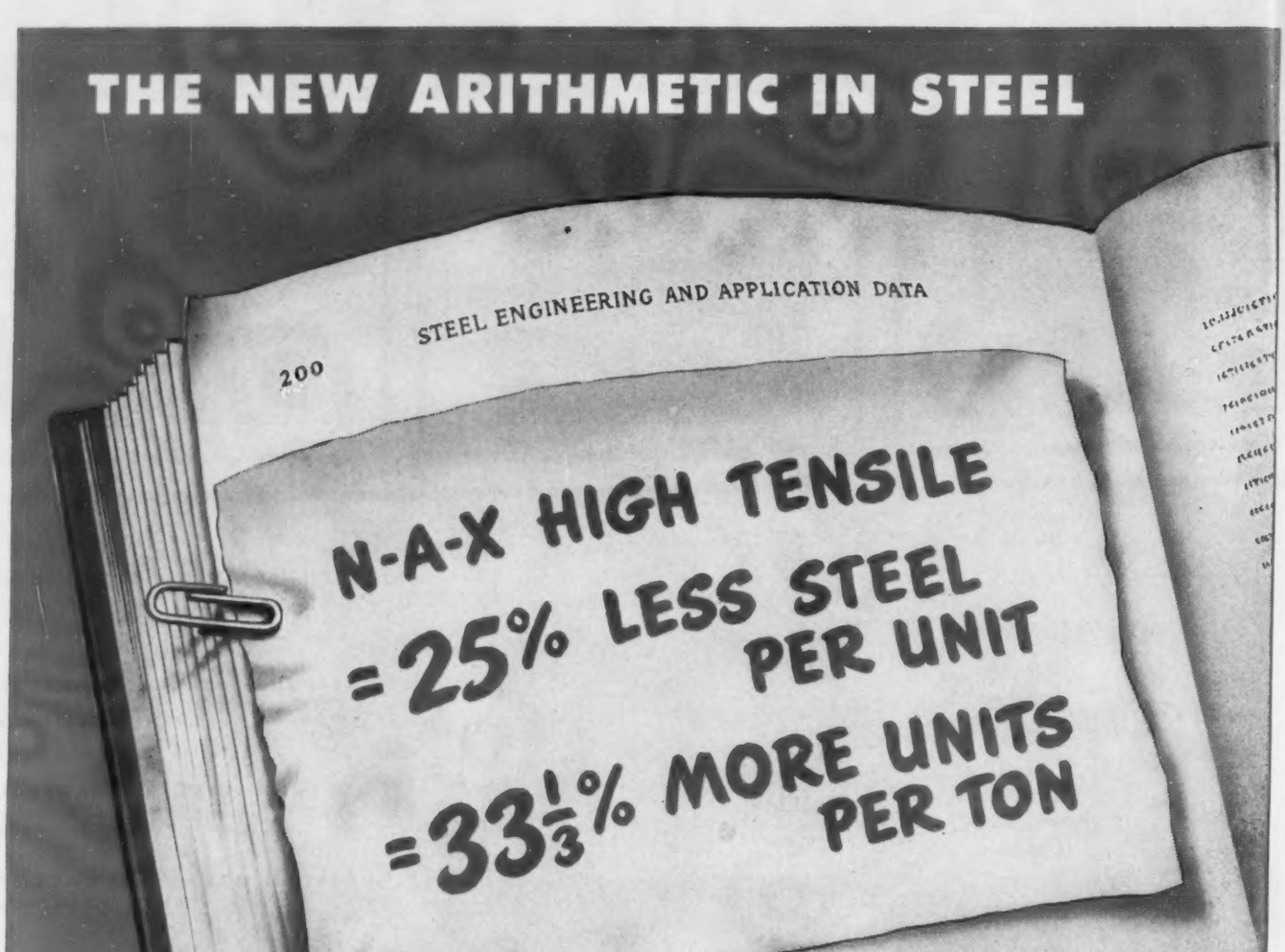
65-TON DIESEL ELECTRIC

0-4-4-0 Type, 400 H.P. Gauges 36″ and up. Maximum T.E. at 25% adhesion, 32,500 lbs.



These and many other Diesel locomotives are available in various sizes, weights and gauges from 3 to 95 tons. The Whitcomb line is so extensive that it enables you to select that particular locomotive that accurately fits your specific haulage requirements. Write for sales literature illustrating and describing Whitcomb locomotives in the Diesel mechanical and Diesel electric models from 3 to 95 tons. These bulletins will be furnished upon request.

S IS WHITCOMB . . .


THE NEW ARITHMETIC IN STEEL
STEEL ENGINEERING AND APPLICATION DATA
200
N-A-X HIGH TENSILE
=25% LESS STEEL PER UNIT
=33⅓% MORE UNITS PER TON

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You can make more and better products per ton by replacing carbon sheet steel with N-A-X High-Tensile

Today, many manufacturers are enjoying the important production advantages brought by N-A-X HIGH-TENSILE steel.

Because of its greater strength, toughness, fatigue- and corrosion-resistance, this low-alloy, high-tensile steel ordinarily permits reduction in sectional thickness of as much as 25%. This means 33⅓% more units per ton of steel—with actual improvement in the strength and durability of finished products. And because N-A-X HIGH-TENSILE steel has exceptional ductility for high-strength steel, it can be deep-drawn and formed into intricate shapes.

In addition to the savings in steel provided by N-A-X HIGH-TENSILE, economies in handling, fabricating and finishing operations can often be effected.

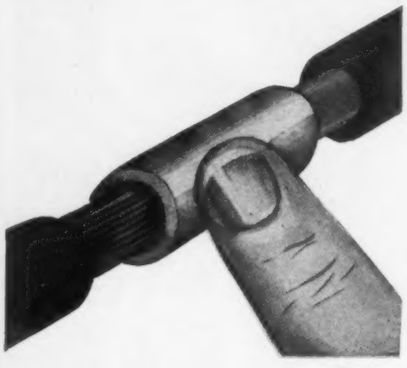
Tomorrow, N-A-X HIGH-TENSILE will be available in ever greater quantities and to a wider field of users. Even though current production can't always keep pace with demand, our engineers will be glad to show you how helpfully N-A-X HIGH-TENSILE steel can fit into your future production picture.

MAKE A TON OF SHEET STEEL GO FARTHER
Specify—
N-A-X
HIGH-TENSILE STEEL

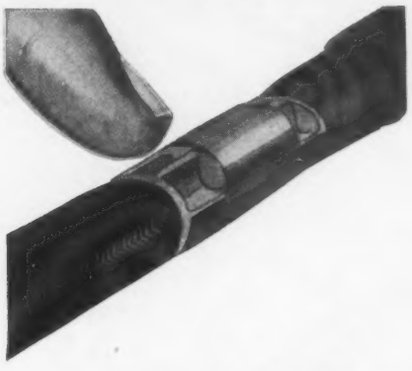
GREAT LAKES STEEL CORPORATION

N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN

UNIT OF NATIONAL STEEL CORPORATION

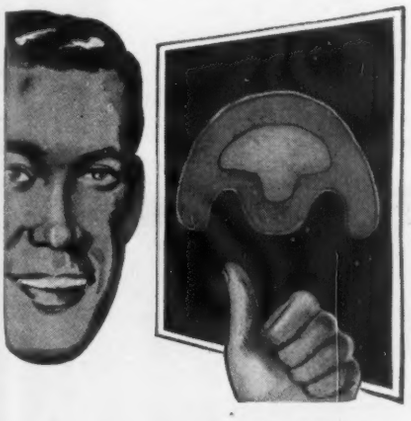


Yes, It's A New Method now used on many of our motors to make winding connections *uniform,* mechanically and electrically. How it works: First, we remove insulating varnish from wire ends by a special process. The bright wire ends are then slipped into this tinned-copper connector. There's no twisting, scraping, unnecessary bending.



Then . . . With A Special Tool, we compress — actually "bond" together — each wire and connector into a homogeneous mass. Every connection is precisely the same as every other . . . no brazing or soldering is used . . . no chance to weaken wires or damage insulation. Wires can't pull out or break-off.

Finally . . . We Slip A Tough, flexible plastic protective tubing over the complete connection. Result: when stator windings are impregnated with insulating varnish and baked out, every connection is uniformly sealed and insulated . . . making a stronger . . . more compact and efficient job . . . another factor demonstrating A-C quality.



Here's An Actual Cross Section microphoto that shows, better than I can tell you, just what happens inside the connection itself. Notice how connector and wires are "bonded" into a single mass. Every connection has precisely the same electrical capacity, assuring balanced phasing.

A-C Builds "Quality" Into Motors

YES, PAYING ATTENTION to details like this new, improved connection contributes importantly toward greater reliability, better performance in motors. Next time you want *good* motors, liberally designed, and with an earned reputation for standing up year after year under toughest operating conditions, specify "Allis-Chalmers". For the complete story call your nearby A-C motor dealer or A-C sales office. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

A2147

ALLIS CHALMERS

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

B-LINE electric motors

More B-LINE Motors were manufactured in 1946 than during the first nine years we were in Production.

B-LINE prestige–"the result of 26 years of dependable performance".

WRITE FOR
BULLETIN 5000 on MOTORS
BULLETIN 7000 on GRINDERS

ADAPTABILITY LONG LIFE
B LINE
ECONOMY
POWER POISE

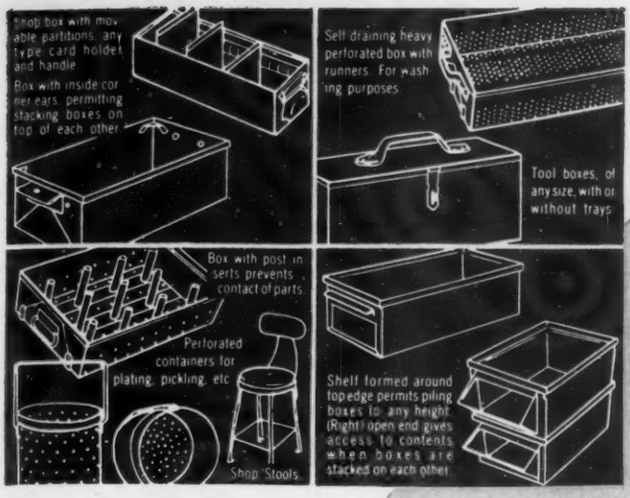
THE BROWN-BROCKMEYER CO

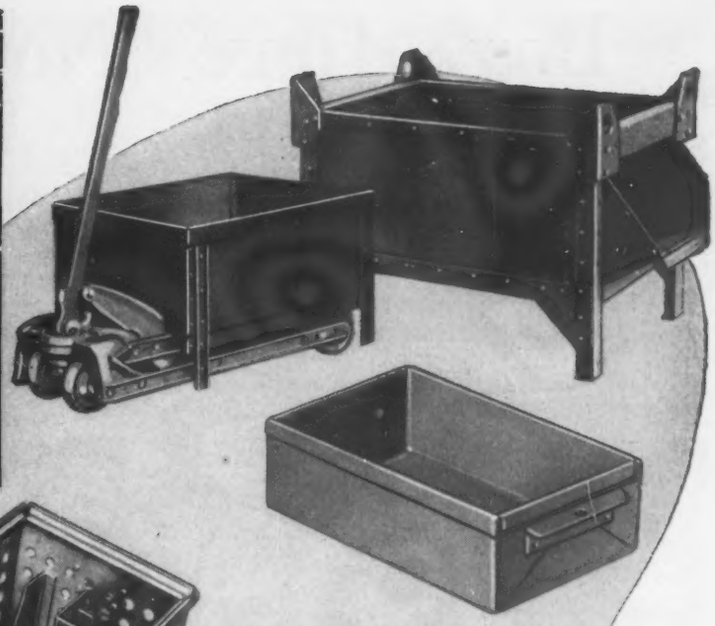
LEADING INDEPENDENT MOTOR MANUFACTURER

1030-1048 SMITHVILLE ROAD

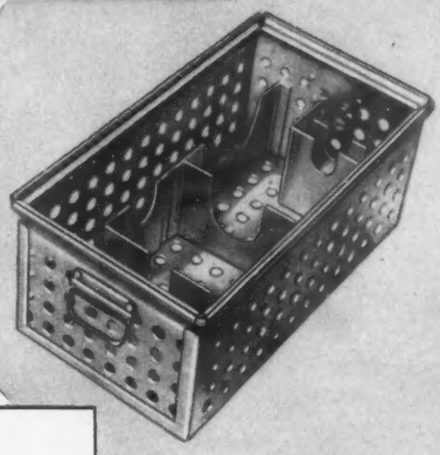
DAYTON 1, OHIO

PLANTS AT DAYTON, WILMINGTON AND XENIA, OHIO—OFFICES IN PRINCIPAL CITIES


Shop box with movable partitions, any type card holder and handle
Box with inside corner ears, permitting stacking boxes on top of each other
Self draining heavy perforated box with runners. For washing purposes
Tool boxes, of any size, with or without trays
Box with post inserts prevents contact of parts
Perforated containers for plating, pickling, etc
Shop Stools
Shelf formed around top edge permits piling boxes to any height. (Right) open end gives access to contents when boxes are stacked on each other



Steel Piling Box with fixed or removable partition designed to hold one set of parts needed for any given assembly or sub-assembly. Big time-saver.



Stacking or Piling Box of excellent design, strong and durable. Any size, to suit your needs. Above: Triple Hem Shop Box made with straight or tapered sides

Shop Barrels, any style or size, built for long life and hard service.

Shop Stools with steel, solid wood or laminated wood seats. Sturdy reinforced legs, of any desired height.

Comfortable Back Rests of several different designs, may be had at a slight extra cost.

TO KEEP PRODUCTION *flowing smoothly*

Where small, loose products are used or produced, perfecting the materials handling system is often the most important factor in attaining lower production cost. An essential part of the system is properly designed, light and strong metal shop containers for the pickup, collection, and conveyance of materials to and from machines, finishing, assembly, packaging and storage.

Cleveland shop boxes, barrels, cans, pans and pails are usually custom-made, because the small extra first cost is trifling compared with the advantages gained, year in and year out, by having containers of exactly the right size, shape and design to fit individual needs and special handling requirements.

Catalog, prices, and design service on request, without cost or obligation.

SHOP EQUIPMENT DIVISION
Cleveland Wire Spring Co.
5250 BROOKPARK RD.• CLEVELAND 9, OHIO

Cleveland **STEEL SHOP EQUIPMENT**

CLEVELAND WIRE SPRING CO.
2012 West 25th Street, Cleveland 13, Ohio
Subsidiary of Reynolds Spring Company, Jackson, Mich.

Boy...Here's News

Washington, Pa., January 6 (Special)—The Washington Steel Corp. is ready to accept inquiries for MicroRold Stainless Steel Sheet and Strip. MicroRold is precision cold rolled stainless steel processed by a unique new practice producing stainless alloys in the continuous coil form—**Modern Practice for the Modern Metal.** Washington's new mill, devoted entirely to flat-rolled stainless steels, will produce substantial tonnages of sheet and strip up to 36 inches in width and in gauges from .004 to .078 inch in commercial tempers and finishes.

Washington Steel Corporation's new mill, novel in design, operation and practice, produces a final outstanding stainless steel product. Advantages to the fabricator are exceptional physical properties, better surface quality, and improved corrosion resistance. In addition, MicroRold offers users of flat-rolled stainless steel sheet and strip a product remarkably uniform to gauge throughout its entire cross-section and length. Naturally, this means more area per ton of steel.

WASHINGTON STEEL CORPORATION

WASHINGTON, PENNSYLVANIA

District Offices

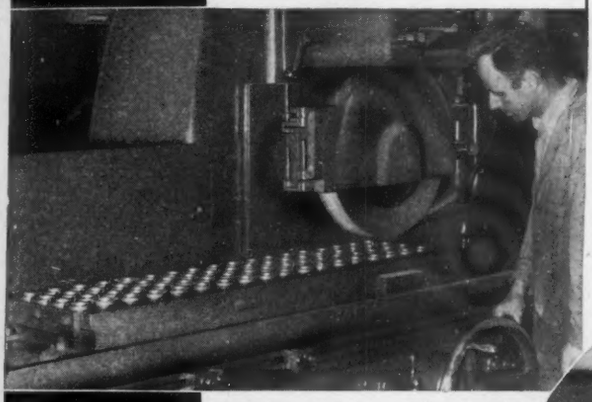
HARTFORD
36 Pearl Street
Hartford 7-7028

DETROIT
2565 Guardian Building
Cherry 0905

CHICAGO
Room 855
141 West Jackson Boulevard
Harrison 1682

LARGE TABLE SPACE MEANS MORE PIECES PER LOAD AND GREATER PRODUCTION *with the Mattison Grinder*

● Cross Slide Draw Bars formerly ground 5 pieces at a time. Now ground on a Mattison Grinder 27 pieces per load, 50% time saving.

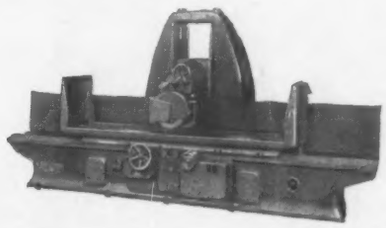


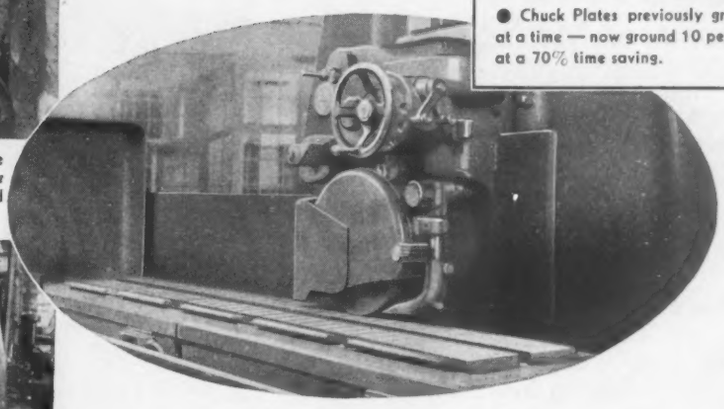
● Caps previously ground few at a time on small grinder. Now, Mattison Grinder handles 75 at a time. Time was reduced from 7 hours to 30 minutes.

● Head Slide Guides formerly ground one at a time in 36 minutes — Now ground on a Mattison Grinder 9 pieces per set-up at a 77% time saving.

Examples: Grinding 75 pieces per load instead of 18 — cut time 80% . . . . . 10 pieces per load instead of 2 — cut time 70%, etc.

Jobs shown indicate the possibilities for increased production by handling large quantities per set-up. In your efforts to obtain maximum production and lower cost, it will pay you to check into the capabilities of the Mattison Grinder.





● Chuck Plates previously ground 1 at a time — now ground 10 per set-up at a 70% time saving.

ADDITIONAL INFORMATION

Also available is free Set-Up Book showing further examples of work ground on Mattison Grinders — Send for a copy today.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

MO-MAX IS TOUGH AND HARD

IT IS DIFFICULT to exaggerate the value of the ideal combination of **toughness and hardness** found only in MO-MAX. No other high speed steel surpasses MO-MAX in these important qualities. For 13 years MO-MAX has demonstrated its outstanding superiority and economy in every kind of cutting tool.

Check the other "plus" features which MO-MAX alone possesses. Order by brand name from one of the mills listed at the left.

Buyer's Guide to Brands of MO-MAX

"LMW" . Allegheny Ludlum Steel Corp.
"MOHICAN" . . . . . Atlas Steels Limited
"BETHLEHEM HM" Bethlehem Steel Co.
"MO-CUT" Braeburn Alloy Steel Corp.
"STAR MAX" . . . . . Carpenter Steel Company
"MOLITE M-I" . . . Columbia Tool Steel Co.
"REX T-MO" . . . . Crucible Steel Co. of America
"DI-MOL" . . Henry Disston & Sons, Inc.
"HI-MO" . Firth-Sterling Steel Company
"REX T-MO" . Halcomb Steel Company
"MOGUL" . . . . Jessop Steel Company
"TATMO" . . Latrobe Electric Steel Co.
"MIDMAX" . . . . . The Midvale Co.
. . . . . St. Lawrence Alloys, Inc.
"S. T. M." . . Simonds Saw & Steel Co.
"MO-TUNG" . . Universal-Cyclops Steel Corporation
"8-N-2" . . . Vanadium-Alloys Steel Co.
"VUL-MO" . . Vulcan Crucible Steel Co.

ONLY MO-MAX GIVES YOU *all* THESE ADVANTAGES

1 **MO-MAX has superior cutting qualities. It is a happy combination of great toughness with high hardness.**

2 **The machinability of MO-MAX is unexcelled, particularly in grinding.**

3 **MO-MAX is economical. Its specific gravity is about 8% less than that of 18% tungsten steel. Thus for the same weight of high speed steel, 13 bars of MO-MAX are obtained as compared with 12 similar bars of an 18% tungsten steel.**

4 **In addition to the standard general-purpose composition of MO-MAX high speed steel, several special types have been developed for particular purposes. There are four with a high cobalt content, one high in vanadium and two that are especially suitable for hot die work.**

5 **MO-MAX was the first of the modern molybdenum high speed steels. For 13 years MO-MAX has demonstrated its superiority in cutting tools.**

★ ★ ★

Send for your copy of the MO-MAX Handbook, sixth edition. Get the full story about this remarkable steel, including easy-to-follow instructions on heat treating.

THE CLEVELAND TWIST DRILL COMPANY • 1258 East 49th Street • Cleveland 14, Ohio

"A LOADFULL AT EVERY GRAB"

and 4 TINES to GRAB with..

Owen Scrap GRAPPLES

incorporate the OWEN exclusive Patented principle which enables each massive tine or arm of the grapple to close and grip independently of the others. The tines meeting the least resistance dig deeply into the material first and each remaining tine digs in turn as resistance is built up in the others.

Independent action permits entire closing power to be concentrated on one tine or distributed among the tines where it is most effective.

Maximum penetration into the scrap assures capacity grabs which are held and lifted in an inescapable grasp.

Widespread acceptance by scrap handlers everywhere, based upon consistent outstanding performance exceeding all other handling methods make it imperative that you investigate Owen Scrap Grapples.

Write for details and illustrated literature.

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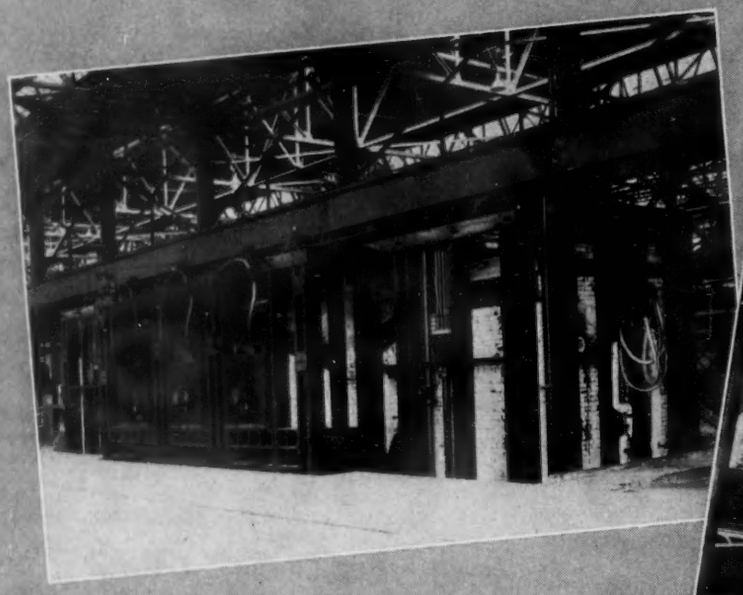
Demand these Features in Your Open Hearth FURNACE



Water cooled Doors and Frames — Automatic Fuel Reversal control — Heavy Structural Framing

Water Cooled Reversing Valves and Dampers — Electric Door Hoists — Combustion Air Fan

Open Hearths, Stationary and Tilting, all capacities—Acid or Basic—Gas, Oil or Combination Firing Furnaces

Sound Design • Rugged Construction
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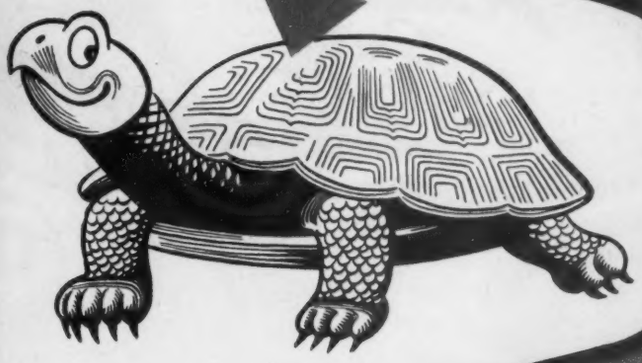
610 SMITHFIELD ST. **LOFTUS ENGINEERING** *corporation* PITTSBURGH, PA.

Designers and Builders — Engineers, Consultants, Contractors

HY-TEST *Safety Shoes*

PROTECTION



WHERE NEEDED

Stock Number H721-4—all purpose safety shoe with Slant-Eze Top, newest Hy-Test comfort feature.

...Insure Workers Feet In Sure Protection

ANCHOR FLANGE STEEL BOX TOE

This flange adds extra strength to the steel arch's sidewall. Anchored between insole and outsole, it also serves to resist shifting and tilting when toe is struck at an angle.

Nature wisely provides the slow-moving turtle with a life-protecting shell. And just as wisely, the makers of Hy-Test Safety Shoes provide a shell of steel in Hy-Test Shoes to give *protection where needed.* This Anchor-Flange Steel Box Toe defies falling objects and other toe-injuring hazards. It is scientifically arched to take the blows . . . specially anchored to hold firm without shifting or tilting. This sturdy shell of steel is so smoothly patterned into Hy-Test's trim, neat lines you hardly know it's there.

Yet, like other outstanding features, it helps distinguish these shoes to make them preferred by more workers than any other safety shoe in America. Husky, pliant leathers, *Slant-eze* tops for ankle freedom, and quality workmanship throughout assure longer wear, extra comfort, and neat appearance in the safety shoe that gives *protection where needed.* Would you like to know how Hy-Test's plan can bring these shoes to workers in your plant? Just drop us a line.

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HY-TEST *Safety Shoes*

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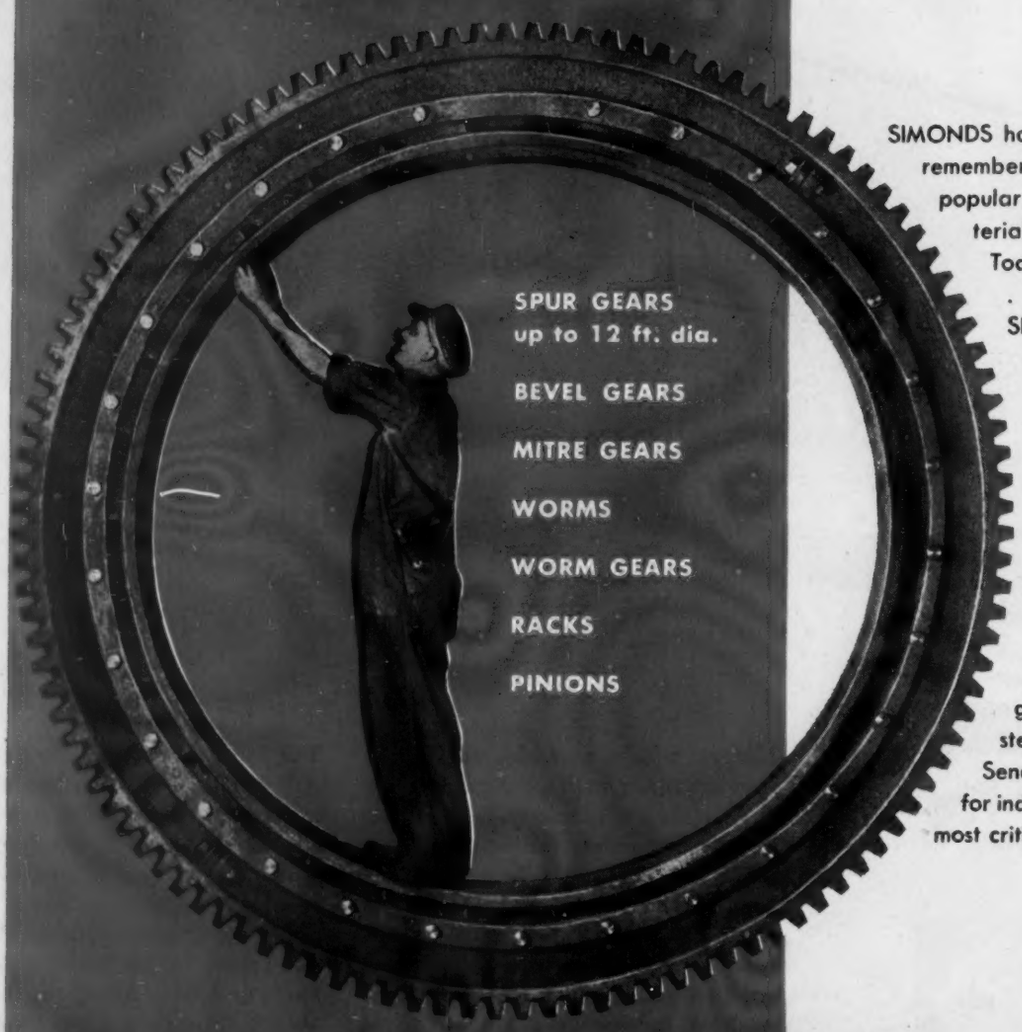
Simonds INDUSTRIAL Gears



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up to 12 ft. dia.

BEVEL GEARS

MITRE GEARS

WORMS

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RACKS

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SIMONDS has been a good name to remember for industrial gears of popular types and sizes in all materials for more than 50 years. Today . . . more than ever . . . you should look to SIMONDS for the latest in proved gear advancements and seasoned craftsmanship. SIMONDS specializes in large diameter gears —Spur Gears up to 145" dia.—Bevel and Mitre Gears up to 60" dia.—Worm Gears up to 72" dia. All materials, too—cast or forged steel, gray iron, bronze, silent steel, rawhide or bakelite. Send SIMONDS your inquiries for industrial gears to meet your most critical requirements.

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FORGINGS

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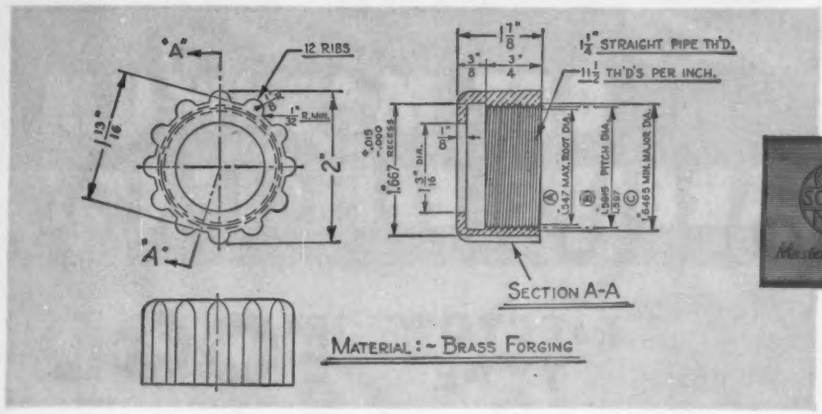
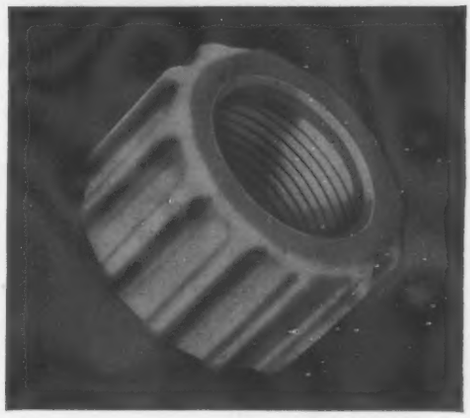
MACHINED FORGINGS AT LOWER COST THAN BY PRESENT PRODUCTION METHODS MAY BE POSSIBLE

Originally, this brass packing nut was a screw machine item, requiring 1168 lbs. of special shape rod per thousand pieces. By changing to forging, Scovill cut down the amount of metal to 619 lbs. per thousand — a two-way saving, because of the lower cost of the forging rod.

But Scovill economy is concerned not only with savings in materials. Our modern machining equipment also saves time in the production of forgings. The net over-all saving in this particular case was about 75 per cent.



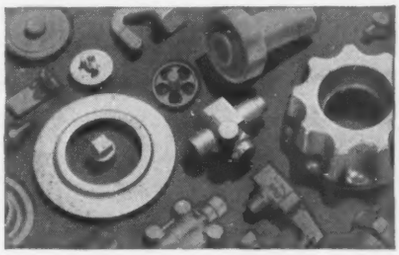


Are you completely satisfied with the brass, aluminum or other non-ferrous metal parts you're now using? If you think there's room for improvement in their design, quality or cost, it would be a smart move to put your problems up to Scovill. Our long and varied experience in non-ferrous forgings has aided many manufacturers by providing them with either better products or lower costs. Let us put that experience to work for *you*.

GET THE FACTS

We'll be glad to send full details on how you can benefit by making Scovill *your* METAL-PART*ner*. Just fill in the coupon below and mail it today.

Scovill Manufacturing Company, Waterbury 91, Conn. *Export Department:* 405 Lexington Ave., New York 17, N. Y.



Please send me information about your metal-working facilities. I am interested in non-ferrous forgings for the applications checked:

- ☐ Aircraft
- ☐ Automobiles
- ☐ Band Instruments
- ☐ Blow Torches
- ☐ Cameras
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Other applications.....

.....

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Forgings Division
20 Mill Street
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Name .....

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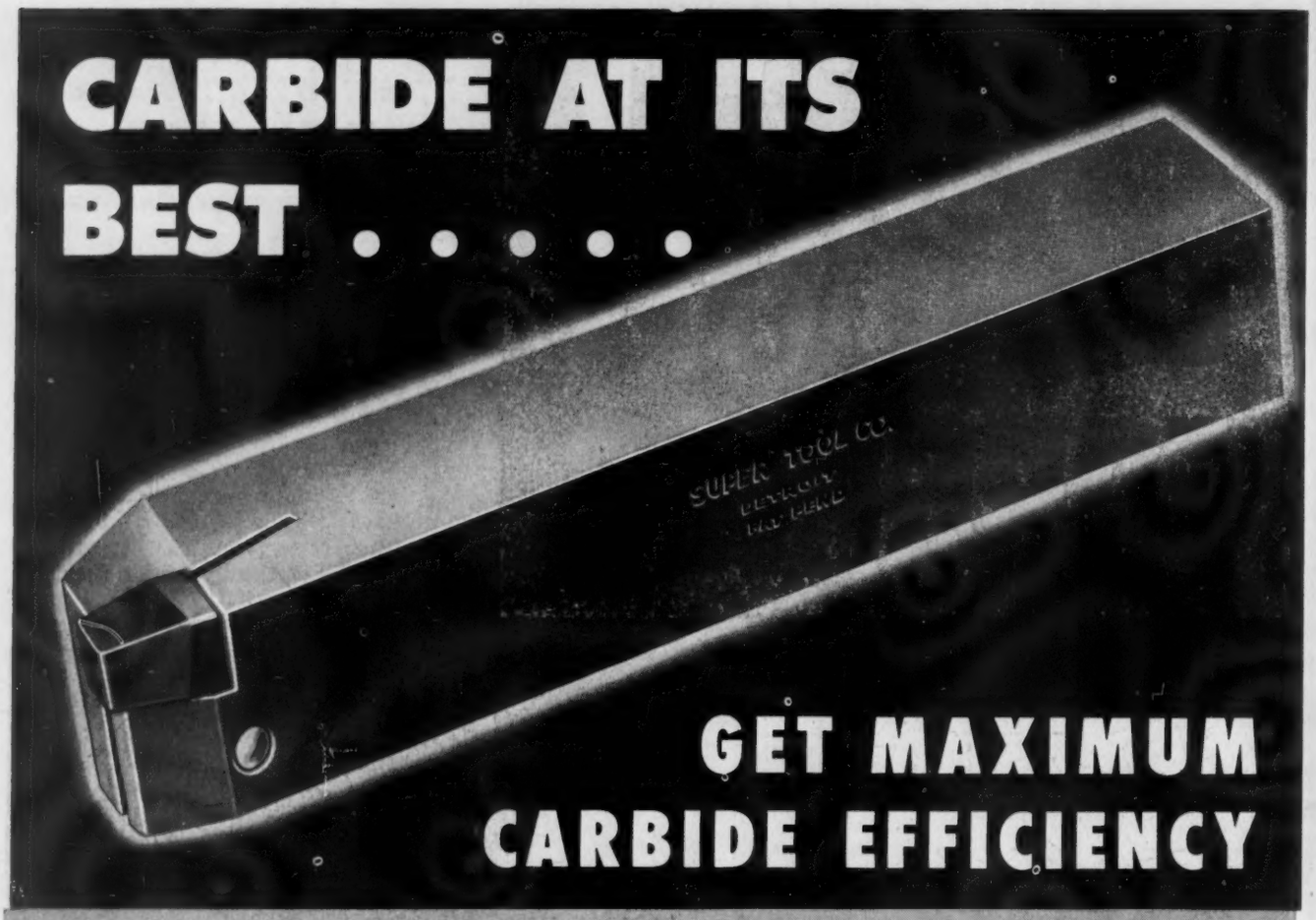
CARBIDE AT ITS BEST . . . . .



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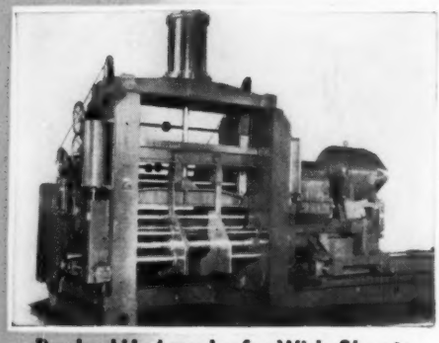
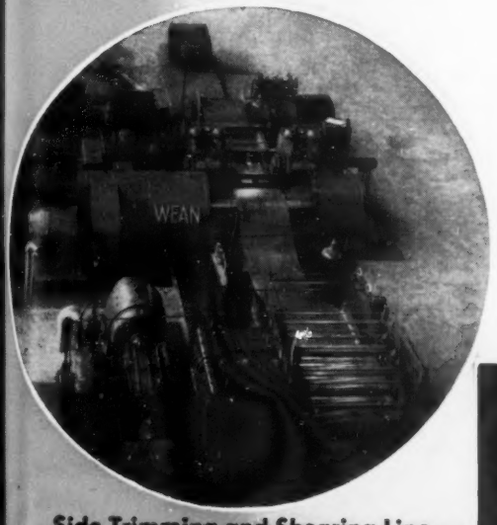
The WEAN ENGINEERING COMPANY, Inc.

WARREN, OHIO

Continuous Strip Pickling Lines



Backed Up Leveler for Wide Sheets



Side Trimming and Shearing Line

Associate Companies

WEAN EQUIPMENT CORPORATION
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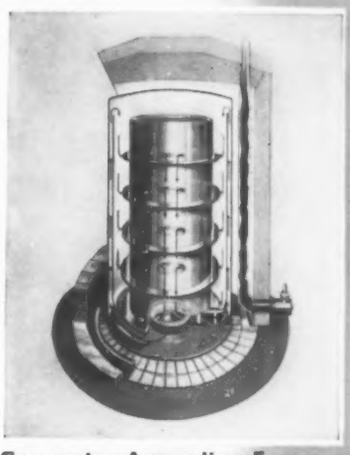
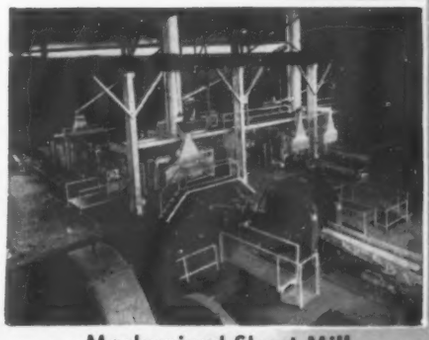


Convector Annealing Furnace

Tin Plate Shearing Line



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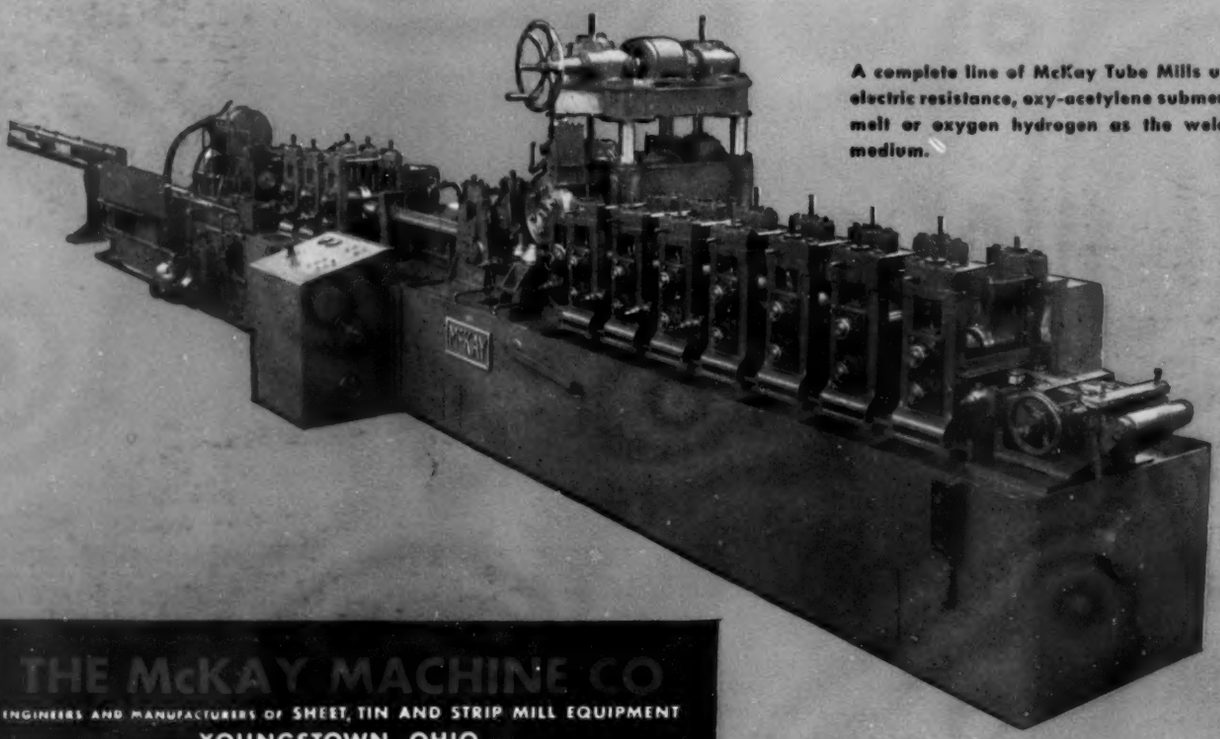
McKAY

Begins its second 25 years of service to the Rolling Mill, Automotive and Fabricating industries.

Our success in the past quarter century can best be measured by the number of friends we have made.

Our future growth will depend largely upon industry's continued confidence in our ability to meet their demand for high quality equipment.

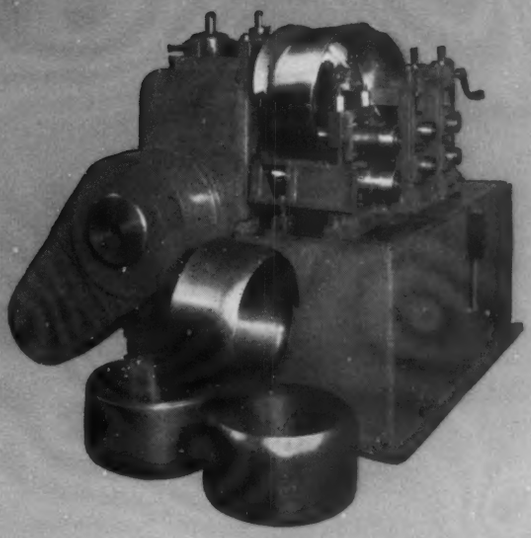
Look to McKay for Up-To-The-Minute Design
Look to McKay for Low-Cost-Production Machinery
Look to McKay to Lead the Way



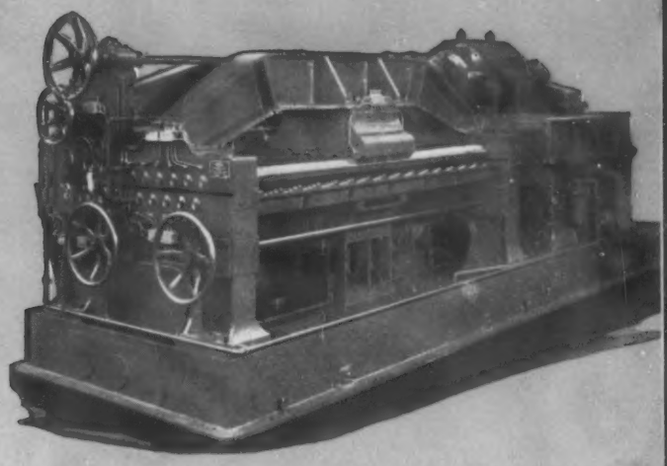
A complete line of McKay Tube Mills using electric resistance, oxy-acetylene submerged melt or oxygen hydrogen as the welding medium.

THE McKAY MACHINE CO
ENGINEERS AND MANUFACTURERS OF SHEET, TIN AND STRIP MILL EQUIPMENT
YOUNGSTOWN, OHIO
ASSOCIATED COMPANY

THE WEAN ENGINEERING CO., Inc. • Warren, Ohio

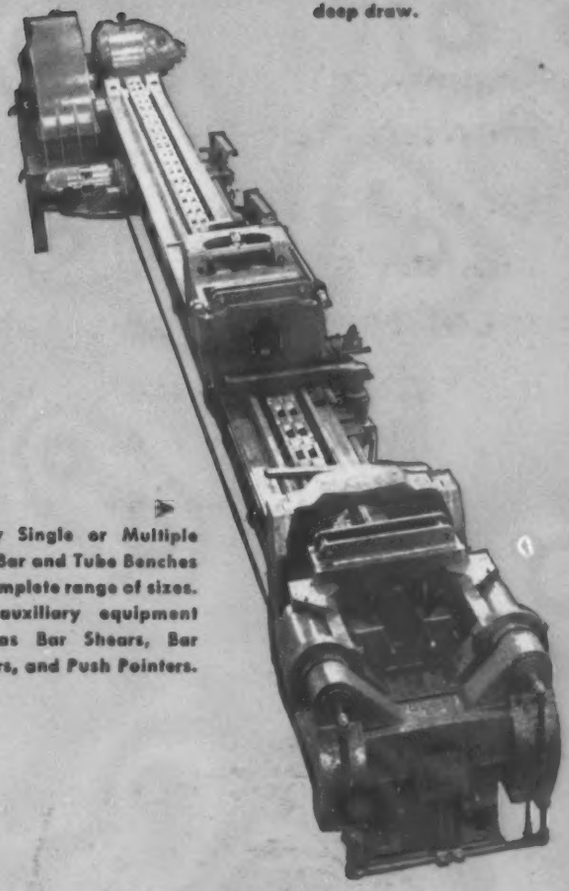


McKay special equipment designed and built to customers' specifications.

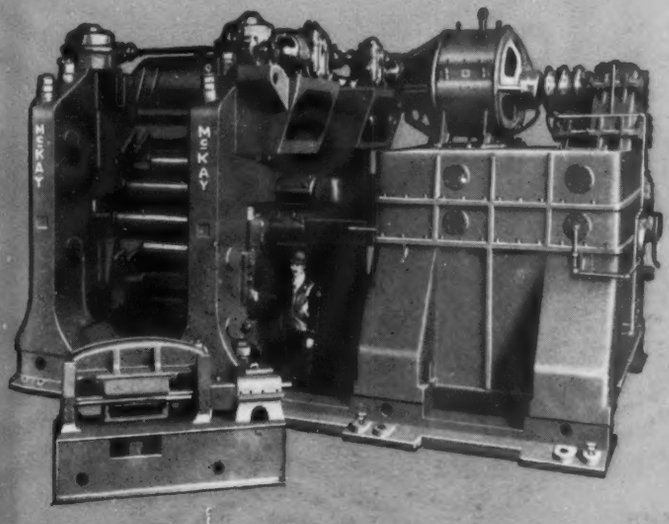


No other equipment compares with these Budd-McKay Processing Machines for relieving strains in auto body sheets requiring deep draw.

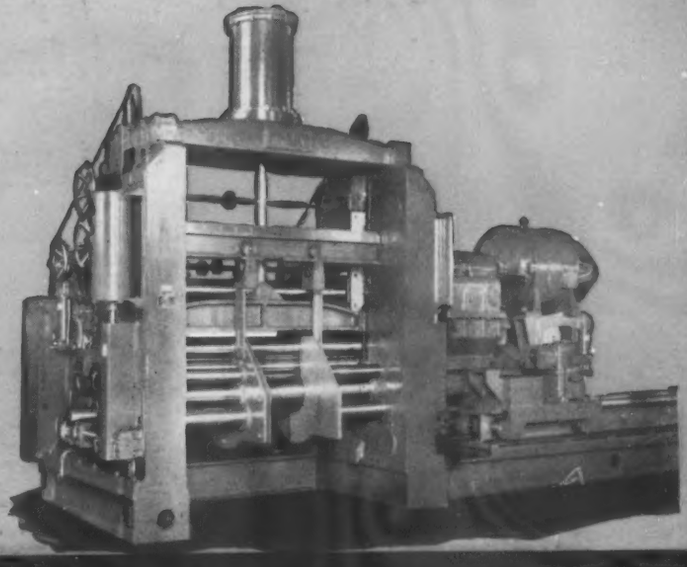
McKay Roll Forming Machines to make any roll formed shape.



McKay Single or Multiple Draw-Bar and Tube Benches in a complete range of sizes. Also auxiliary equipment such as Bar Shears, Bar Pointers, and Push Pointers.



A complete range of sizes of McKay Roller Levelers to flatten material ranging from tin plate to armor plate.



No continuous pickling or cut up line is complete without a McKay Processing Uncoiler with Coil Car.

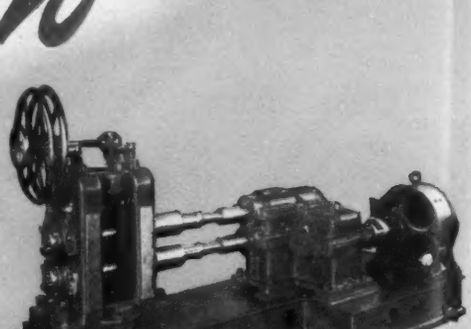
Wean EQUIPMENT Corporation

THE Wean Equipment Corporation are recognized as specialists in high-efficiency strip and wire mill equipment.

COLD ROLLING MACHINERY
For 36" Wide Material and Narrower

MILLS • REELS • SLITTERS • LEVELERS
COILERS • EDGERS • SCALE BREAKERS • SHEARS
SCRAP BAILERS • CONTINUOUS PICKLING

WIRE MILL EQUIPMENT
WIRE DRAWING MACHINES, PATENTING, GALVANIZING AND TINNING TAKE-UP FRAMES, WIRE FLATTENING, SPOOLERS, NAIL GALVANIZING AND BLUEING FIELD FENCE and BARBED WIRE MACHINES



Small Cold Roll Strip Mill

Strip Reel and Slitting Unit

WEAN EQUIPMENT CORPORATION
CLEVELAND • OHIO

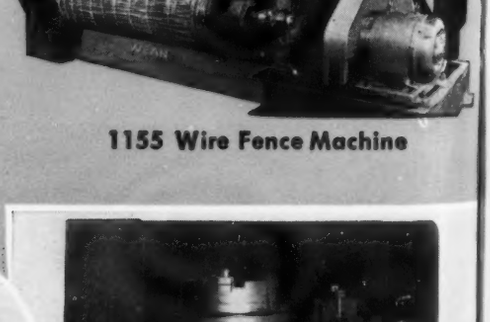
Barbed Wire Fence Machine

HOLMQUIST BARBED WIRE AND WIRE FENCE MACHINERY

1155 Wire Fence Machine

Fine Wire Tinning Unit

Multiple Wire Takeup Frame



Two Draft Continuous Wire Drawing Mac

I'm the man who puts the heat on!

I'm a heat treater in a steel foundry—name's Charlie Morris.

My job is to make castings better—make them give you the exact properties you want—by heating, then cooling in air, or quenching in oil or water.

That changes the structure of the steel, to make it harder or tougher or stronger.

Sounds like pretty technical talk for a man who works in a foundry, and it is a long way beyond what my grandfather used to do when he soused a red hot horseshoe in a tub of water.

But my responsibility is to know just what can be done by heat-treating, and then do it.

Maybe you don't care about the details—the kind of furnaces we use, the temperature controls, the kind of quenching and all that.

But you are interested in this. Because my crew and I understand a lot about this fairly new science of heat-treating, we can give you in cast form, at fair costs, just about any property of steel you want.

' ' '

The first step in building an improved product, or in cutting costs, is to plan it that way—a steel castings engineer can help you. Steel Founders' Society, 920 Midland Bldg., Cleveland 15, Ohio.

MODERNIZE AND IMPROVE YOUR PRODUCT WITH

STEEL CASTINGS

MODERNIZE with BROSIUS STEEL MILL EQUIPMENT

Easily Operated Brosius Chargers

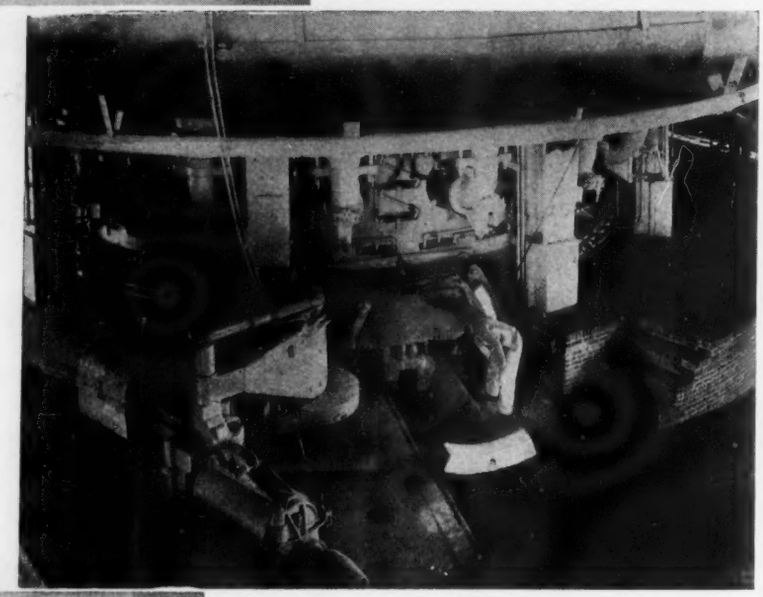
The machine pictured left is a Brosius 2,000 pound Auto Floor Manipulator. It not only manipulates the piece under the hammer or press, but also charges and draws the heating furnaces. All Brosius Auto Floor Machines are traveled over the floor by an electric motor while all other motions, including steering, are hydraulically actuated. They require no tracks or runways and they are particularly adapted to use in restricted areas.

Brosius Auto Floor and Charging Machines (tongs and box types) are built in capacities of from 2,000 to 20,000 pounds.

Brosius Clay Guns

Brosius Electric Mechanical Clay Guns remove danger of accidents while plugging the tapping hole. All motions are controlled from within the cast house and no one is required in the danger zone during the operation.

The boom can be column or pedestal mounted, has a positive drive, and the gun travels into and out of the hole at a uniform speed.



Brosius Goggle Valves

Industries that are now using Brosius Goggle Valves have found them to be efficient and dependable. Two separate drives are provided on all Brosius Valves having a clear opening of 42″ and larger, one drive for operating the movement of the flexible seats and one for swinging the plate. The latter drive may be hand or motor operated.

Write for descriptive literature and our NEW Catalog on these products — NO OBLIGATION.

Brosius Equipment is covered by patents, allowed and pending, in the United States and Foreign Countries.

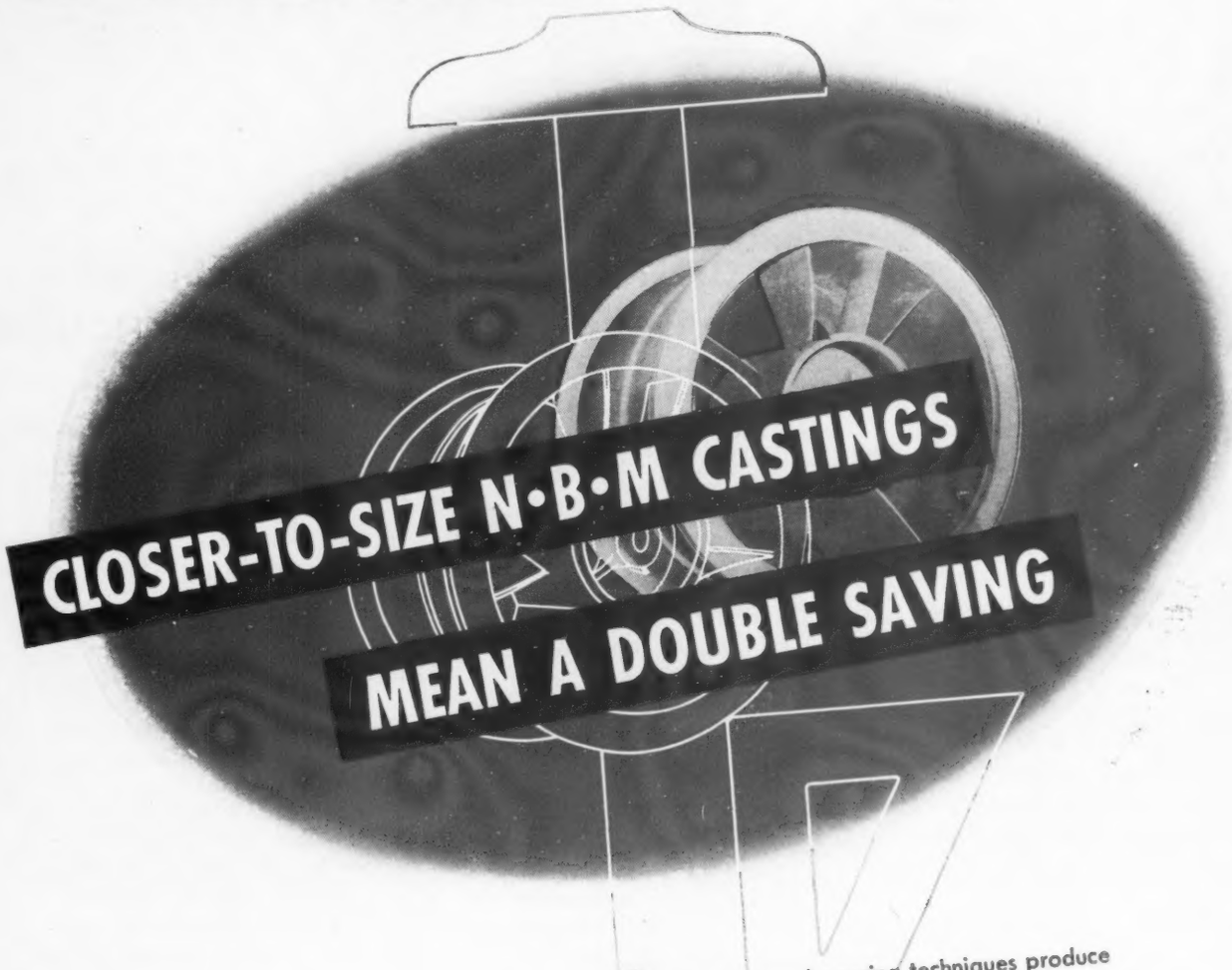
Edgar E. **BROSIUS** *Company, Inc.*

Designers & Manufacturers of Special Equipment for Blast Furnaces & Steel Mills

SHARPSBURG, Pittsburgh (15) PENNSYLVANIA

Brosius Equipment is constantly being improved to meet new and more difficult requirements of present-day production.

N·B·M BRONZE PARTS
BETTER BRONZE PARTS



CLOSER-TO-SIZE N·B·M CASTINGS MEAN A DOUBLE SAVING

Our molding and pouring techniques produce "thin-skinned" castings with good solid metal immediately below the surface. *Result:* we can cast so close-to-size that you save up to 30% in weight plus proportionate savings in expensive machining time.

Whether you buy N-B-M castings in the rough or machined you save substantially.

N·B·M BRONZE CASTINGS
We put more service into them— you get more service out of them

NBM

AMERICAN **Brake Shoe** COMPANY

NATIONAL BEARING DIVISION
ST. LOUIS • NEW YORK

PLANTS IN: ST. LOUIS, MO. • PITTSBURGH, PA. • MEADVILLE, PA. • JERSEY CITY, N. J. • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

SOS

ave Or crap?

WHEN CORROSION PROBLEMS CALL FOR HELP YOU CAN SAVE INSTEAD OF SCRAPPING...with *UCILON!*

IS CORROSION sending your plant, piece by piece, to the scrap heap? If it is—if corrosion is excessive and maintenance a big expense—it will pay you to investigate UCILON. Hundreds of satisfied users report that Ucilon stands up *longer* under *more* corrosives than any other material they have ever used. For example:

In a paper mill, conveyor pipe for sulphite paper pulp, containing 7% sulphuric acid and 9% alum, was ordinarily corroded through in 6 to 8 weeks. Coated with Ucilon, this pipe now lasts *7 to 10 months longer.*

In a chemistry laboratory, Ucilon was used on corrosion-testing apparatus. Subjected to fumes and spray from hydrochloric, sulphuric, and acetic acids, sodium hydroxide and sodium chloride solutions for *several months* . . . the finish is still in excellent condition.

We want you to try Ucilon on your *toughest* jobs—jobs that are too tough for ordinary maintenance paints. For we are confident that Ucilon will give you surface protection that will mean big savings in upkeep costs. Write today for complete information.

WHAT IS Ucilon*?

UCILON is a surface coating material formulated from new and improved inert synthetic resins. It is air drying and can be applied to any metal, wood, or concrete surface by brushing, spraying or dipping. Upon evaporation of the solvent, a hard, durable "plastic" coating is formed.

UCILON is remarkably resistant, to acids, alkalies, salts, alcohols, oils, water, cleaning compounds, and industrial oxidants. It has excellent flexibility, toughness, adhesion—and no taste or odor when dry. It is non-toxic, fungus-inhibiting, has good electrical resistance, and gives an attractive glossy finish.

**Ucilon is a trademark registered in the U. S. Patent Office, by United Chromium, Incorporated, for a synthetic resinous coating material.*

UNICHROME

PROCESSES AND MATERIALS

FOR SURFACES THAT SURVIVE

Chromium Plating • Porous Chromium • Unichrome* Copper
Unichrome Lacquers • Ucilon* Protective Coatings
Unichrome Stop-Off Lacquers and Compounds • Unichrome Dips
Unichrome Rack Coatings • Anozinc* Compounds • Unichrome Strip

**Trade Mark Reg. U. S. Pat. Off.*

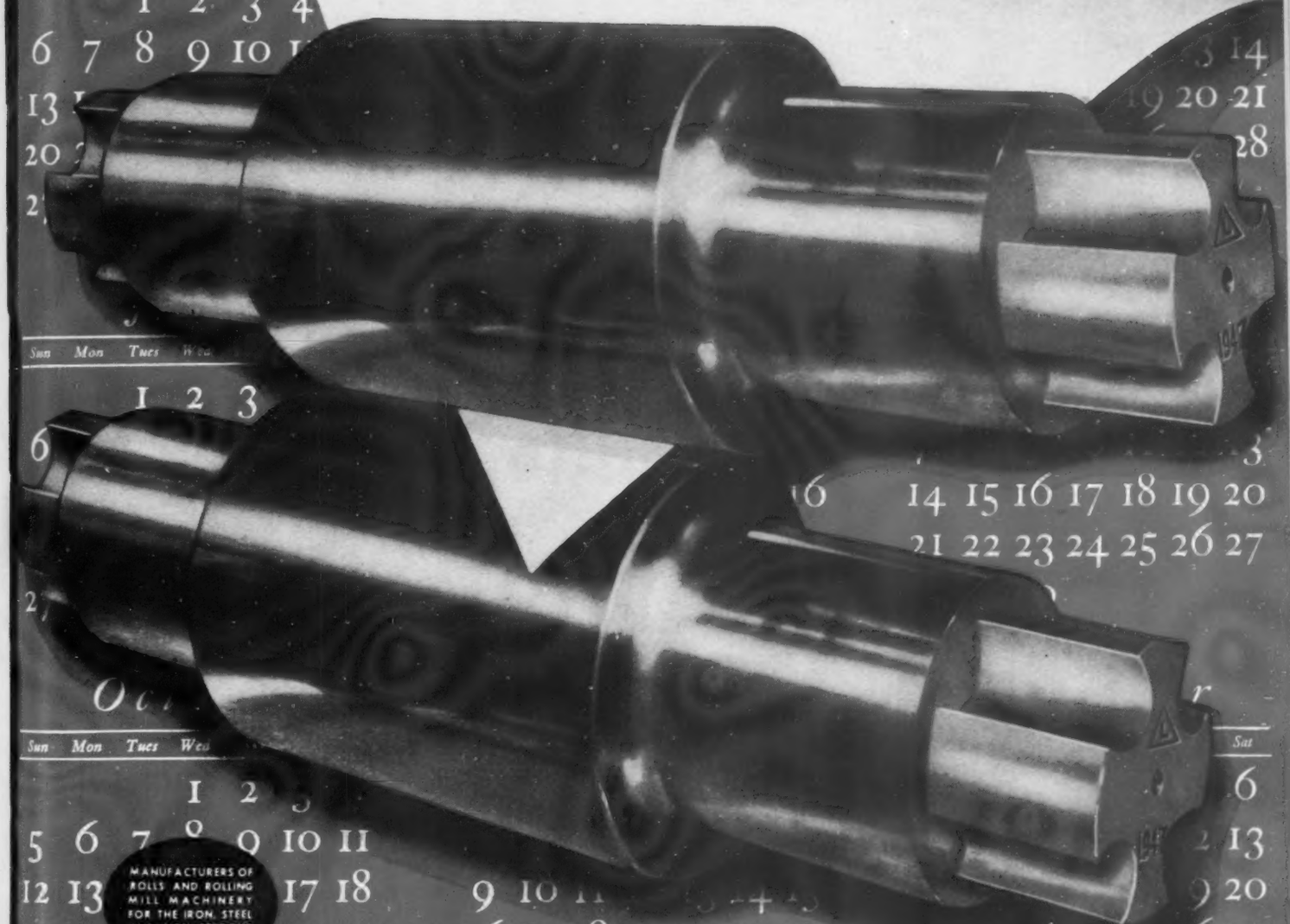
UNITED CHROMIUM, INCORPORATED

51 East 42nd St., New York 17, N. Y. • Detroit 7, Mich. • Waterbury 90, Conn. • Chicago 4, Ill. • Dayton 2, Ohio • Los Angeles 11, Cal.

The World Needs Rolled Metals

Production is going to determine your share of the market this year . . . and volume will be higher in mills where metals are rolled with Lewis Rolls at LESS COST PER TON.

LEWIS FOUNDRY AND MACHINE
DIVISION OF BLAW-KNOX COMPANY
PITTSBURGH, PA.



MANUFACTURERS OF ROLLS AND ROLLING MILL MACHINERY FOR THE IRON, STEEL AND NON-FERROUS INDUSTRIES

LEWIS ROLLS

YOUR steel requirements can best be served by a progressive, superbly staffed, completely integrated steel producer. WISCONSIN is exactly that.

Progressive is more than a word at WISCONSIN. It's a *fact* that has been demonstrated by our development of Sulfite-Treated Steel—the highly machinable steel that overcomes the faults of resulphurized steels. "H" steels of guaranteed hardenability are a specialty of ours. Both of these steels are earning wide acceptance and acclaim.

Superbly Staffed by top-flight steelmen, WISCONSIN has one prime objective: to make the best possible steel for our customers. Every man in the mill works toward that goal.

An Integrated Organization gives WISCONSIN complete control of the product from the ore mines to the customer. That control means finer steel.

Watch WISCONSIN for steel progress. We can't supply all the steel our customers need but the picture is improving. We haven't compromised with quality. Our sales and metallurgical staffs are ready to serve you.

WISCONSIN STEEL OPERATIONS

Ore Mines • Coal Mines • Ore Freighters
Blast Furnaces • Open Hearth Furnaces • Rolling Mills
Heat-Treating, Cold Finishing and Annealing Facilities

WISCONSIN STEEL COMPANY
(Affiliate of International Harvester Company)
180 North Michigan Avenue **Chicago 1, Illinois**

WISCONSIN STEEL

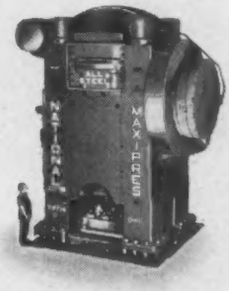
QUALITY

The high physical qualities of this Automotive Differential Side Gear are due to the rigidity and power of The National High Speed Forging Maxipres plus National technique.

Greatly increased output, marked savings of expensive material and greatly reduced machining time are additional benefits.

Send us your prints or ask for a National representative. No obligation!

★



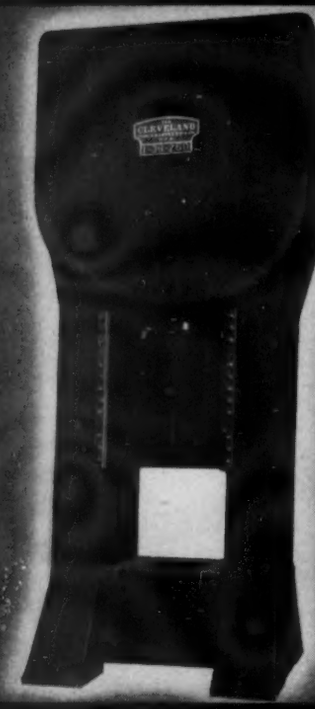
NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET AND WIRE NAIL MACHINERY

New York Detroit Chicago

Modern CLEVELAND *Presses*

THERE'S A CLEVELAND POWER PRESS FOR EVERY REQUIREMENT



Single Point

STRAIGHT SIDED

The Press illustrated has a capacity of 250 tons, bed area 42" by 36" and a stroke of 12". However, all Cleveland Modern Presses can be furnished in sizes and capacities to suit particular requirements.

Two Point

STRAIGHT SIDED

Provided with 20" stroke, 6" adjustment, 45" shut height and a bed area of 55" by 108", this Cleveland Two Point exerts a pressure of 450 tons, and this type can be furnished in numerous combinations of stroke, adjustment, bed area, etc.

Four Point

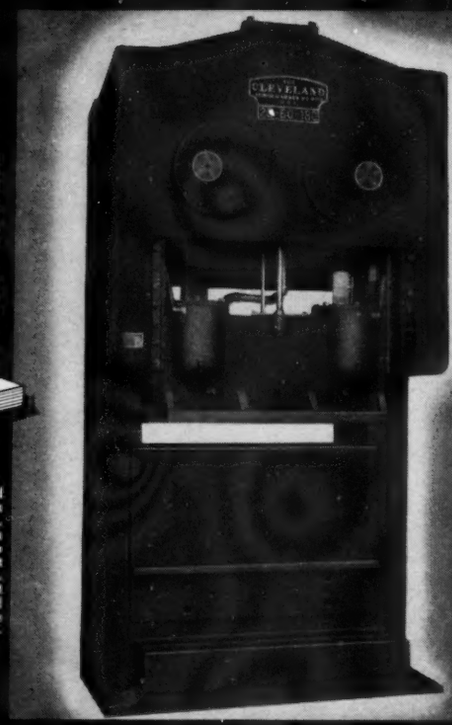
STRAIGHT SIDED

Cleveland Four Point Presses are arranged with a connection at (approx.) each corner of the slide and this feature assures uniform pressure whether the dies are on center or off center. Openings can be provided in the uprights to permit feeding material right and left across the dies.

Two Point

GAP

Except for the design of the frame, which is an overhanging Gap type, this Cleveland Press is similar in construction to the Modern Straight Sided type. The gears, flywheel and drive unit are completely enclosed in the crown and there are no overhanging projections.



The CLEVELAND

PUNCH & SHEAR WORKS COMPANY

NEW YORK — CHICAGO — DETROIT — PHILADELPHIA — PITTSBURGH

MAIN OFFICE & WORKS: ● ST. CLAIR & EAST 40th STREET ● CLEVELAND 14, OHIO

Visual proof of the value of interrupted quenching! The top two knife blades, quenched the old way, show cracks and warpage. The lower knife blade shows that Mar-Temp Salt at 400° F. holds them straight, with no loss in RC hardness. For details, write E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

NELOY *Steel Castings* AND *Cut Gears* IN INDUSTRY

NELOY (or NELOY MOLY) by performance in its broad range of uses has become the synonym for the Ideal Alloy Steel . . . possessing machineability, toughness, strength, hardness and resistance to shock and wear. Where these qualities are demanded in the design and production of industrial machinery, metallurgists and designing engineers agree on Neloy (or Neloy Moly) castings as first choice.

Here are the qualities of Neloy (or Neloy Moly) flame hardening:

1. No sharp line of demarcation between case and core . . . no quick change in chemical analysis as characteristic of ordinary case hardened material.
2. The surface material depends not on hardness alone, but combines high hardness & toughness to resist wear and impact.
3. A core value that is equal to that of alloy steel, offering fatigue or impact values much higher than the regular case hardened product.
4. Hardened depth for necessary wear resistance equal to case hardening treatment at about ⅓ the cost.
5. A surface that will not spall with vibration or impact.

Write for Bulletin No. 7.

COMPARISON OF THE PHYSICAL PROPERTIES FOR NELOY AND NELOY-MOLYBDENUM STEELS

	ULTIMATE TENSILE LBS. SQ. IN.	ELASTIC LIMIT OR YIELD POINT LBS. SQ. IN.	ELONGATION PERCENT	REDUCTION OF AREA PERCENT	BRINELL	SCLEROSCOPE
Neloy, Annealed	75/ 85,000	50/ 60,000	20—30	30—40	156—163	23—23
Neloy-Molybdenum, Annealed	85/ 95,000	45/ 85,000	20—25	30—40	170—197	24—30
Neloy No. 1, Normalized	85/ 90,000	55/ 65,000	23—30	30—40	163—170	23—24
Neloy-Molybdenum, Normalized & Drawn	90/ 110,000	65/ 85,000	18—25	30—40	190—220	28—33
Neloy No. 2, Normalized & Drawn	90/ 93,000	65/ 75,000	23—28	35—45	174—198	24—28
Neloy-Molybdenum No. 2-A	100/ 115,000	70/ 90,000	15—20	35—45	207—229	28—35
*Neloy No. 3	100/ 110,000	80/ 90,000	20—26	40—50	202—240	29—33
*Neloy-Molybdenum No. 3-A	125/ 140,000	115/ 130,000	12—15	30—40	250—280	38—41
*Neloy No. 4	115/ 130,000	95/ 110,000	15—20	35—45	240—268	33—37
*Neloy No. 5	125/ 135,000	110/ 125,000	12—20	30—40	268—288	37—40
*Neloy-Molybdenum No. 5-A	140/ 160,000	130/ 145,000	10—12½	20—30	302—331	47—50
*Neloy No. 6 †	135/ 150,000	120/ 135,000	9—18	30—40	286—302	40—42
*Neloy-Molybdenum No. 6-A†	160/ 180,000	145/ 160,000	7½—10	15—25	341—375	52—57
*Neloy Heat-Treatment No. 7†	145/ 165,000	135/ 155,000	12—20	35—55	264—302	36—42
*Neloy Heat-Treatment No. 8†	165/ 190,000	155/ 175,000	8—14	30—45	302—264	42—51
*Neloy Heat-Treatment No. 9†	190/ 220,000	175/ 195,000	8—14	25—45	364—477	51—66
*Neloy Heat-Treatment No. 10-A†‡	190/ 220,000	175/ 195,000	8—14	25—45	364—477	51—66
*Neloy Heat-Treatment No. 10-B†‡	218/ 270,000	190/ 240,000	8—12	20—35	477—590	66—80

*These Steels are liquid quenched and drawn. The maximum size piece to be quenched should not exceed 6 ft. x 6 ft. x 3 ft.

†These are fully hardened and no machining can be done after heat-treating. Seven classes of physical values are listed, as we recommend values comparable to the size of the gear tooth so that uniformity of toughness will be obtained from the surface to center of the tooth.

‡Physical properties of outer fibers. (Core properties depending on previous treatment.

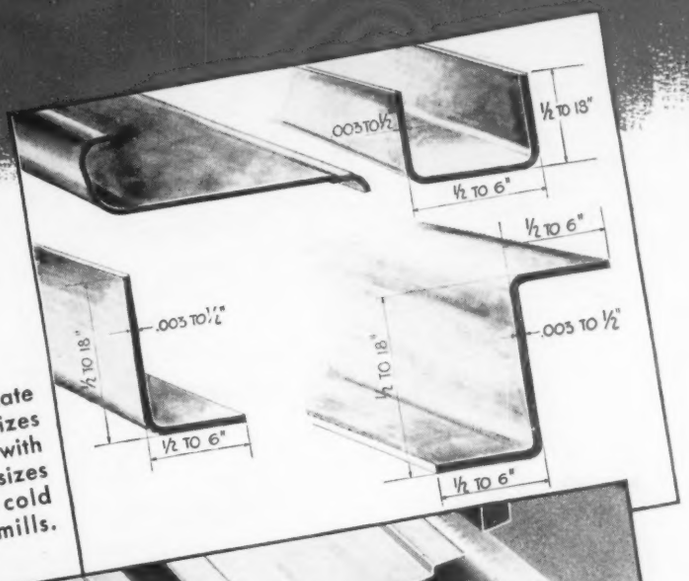
Treatment No. 7—Small pitch gears up to and including 5 DP. Treatment Nos. 8 and 10-A—Medium pitch gears up to and including 3½ DP. Treatment Nos. 9 and 10-B—All gears over 3½ DP, up to and including ½ DP, or 6-inch CP. Treatment No. 10-A—For cast tooth gears, any pitch.

NATIONAL ERIE CORPORATION

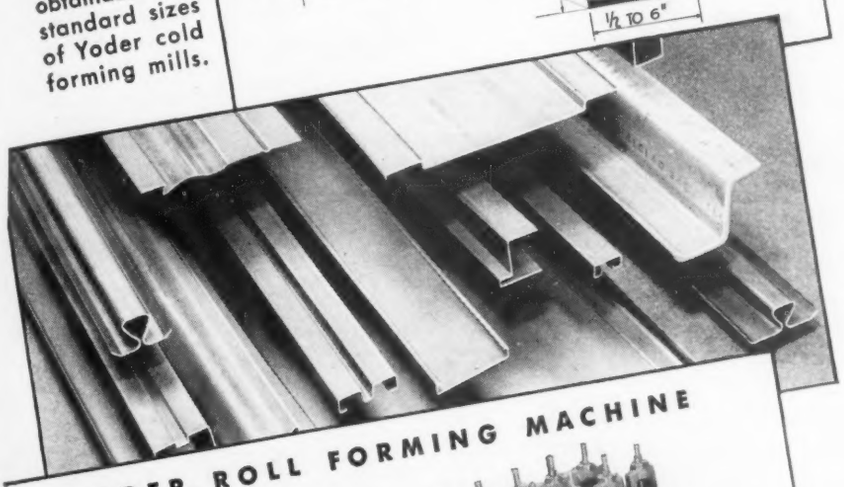
ERIE, PENNSYLVANIA • U. S. A.

The SEVEN *big advantages of using* COLD-ROLL-FORMED SHAPES

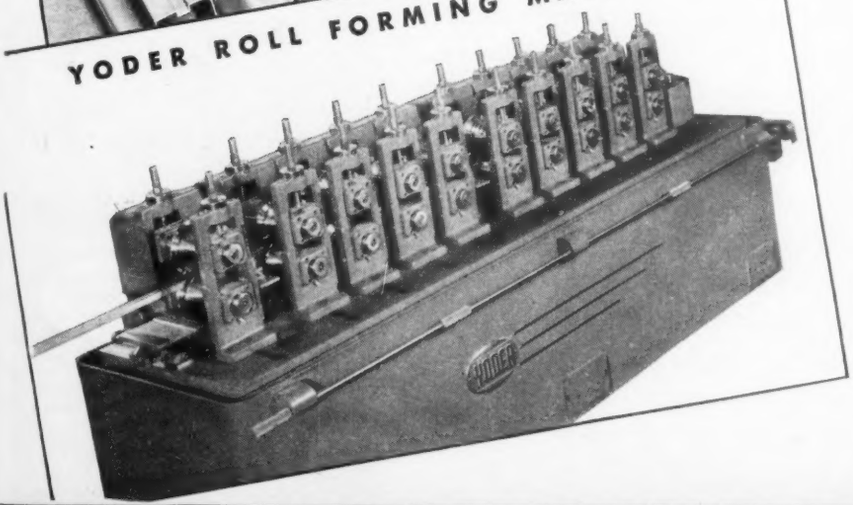
STRUCTURALS • PANELS • TUBING • MOULDINGS • TRIM



Figures indicate range of sizes obtainable with standard sizes of Yoder cold forming mills.



YODER ROLL FORMING MACHINE



SERIES OF SEVEN

No. 1

Uniform Thickness

Flat rolled products are more uniform in thickness than hot rolled or extruded structural shapes. The latter tend to be thicker near the base corners, tapering towards the outside edges. This is an obstacle to uniform, accurate bending, welding and fitting in modern production machinery, and cost is increased because more hand fitting is necessary.

This is only one out of seven equally important reasons why more and more structural shapes, as well as panels, mouldings and trim, are now being produced from flat sheets or coiled strip in Yoder cold-roll-forming mills.

Many operations on sheet metal or plate, formerly considered practical only with older, slower methods, are now being done on a Yoder production line at a small fraction of the former unit cost. This is because Yoder has developed auxiliary equipment for coiling, slitting, straightening, embossing, curving, welding, and cutting-off, tied in with the roll forming, at no sacrifice of speed.

If you suspect there might be any such operations now in your plant, you may consult us without cost or obligation, and with the utmost assurance that if our engineers find high-speed, low-cost Yoder production impractical, we will tell you so.

Send for Bulletins, giving valuable data on the advantages and possibilities of cold-roll-forming.

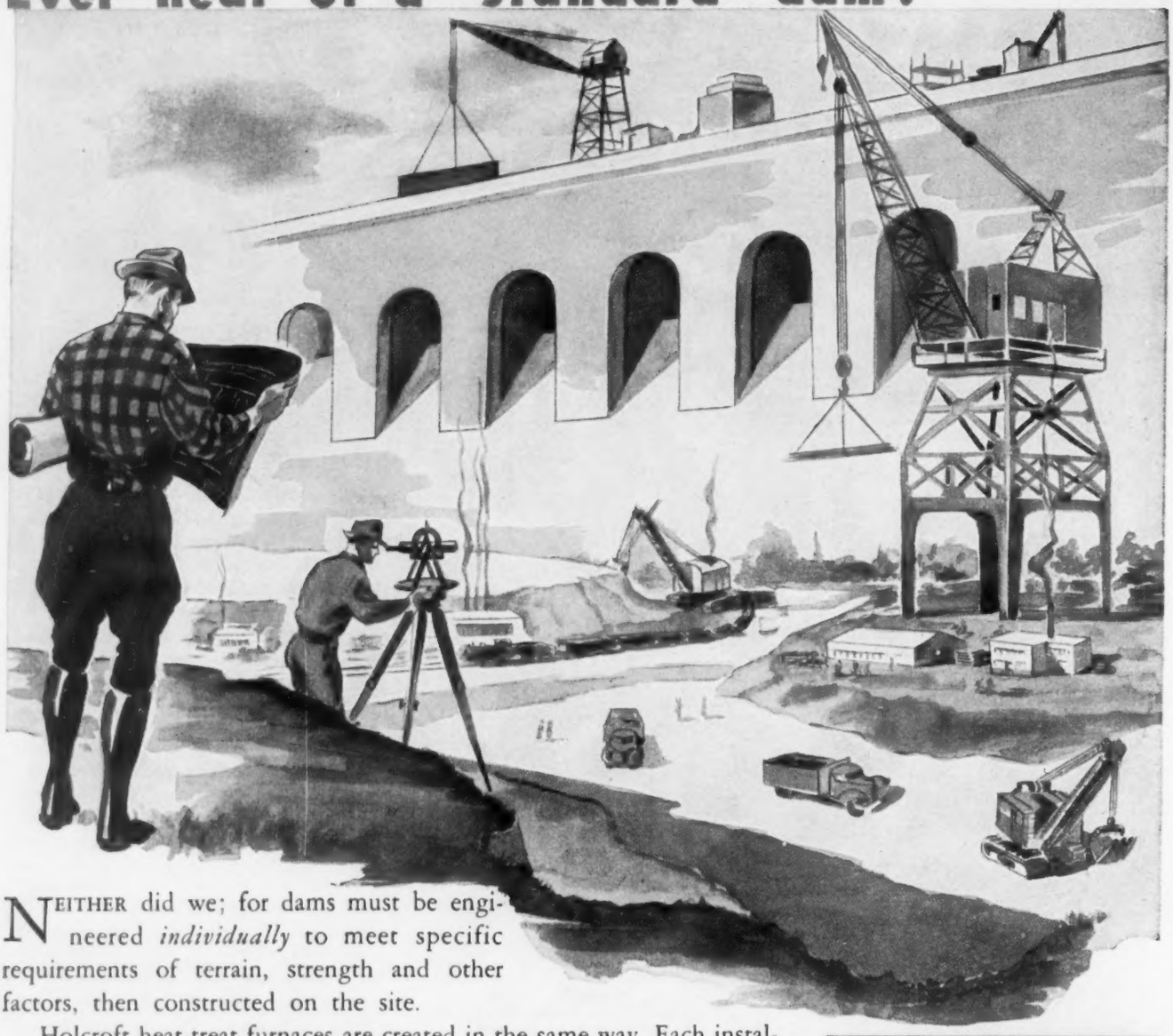
THE YODER COMPANY
5502 Walworth Ave. • Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING

ROLL FORMING AND TUBE MILL MACHINERY

36 YEARS' LEADERSHIP • COILING • SLITTING • FORMING • EMBOSSING • CURVING • WELDING • CUTTING-OFF

Ever hear of a "standard" dam?



NEITHER did we; for dams must be engineered *individually* to meet specific requirements of terrain, strength and other factors, then constructed on the site.

Holcroft heat-treat furnaces are created in the same way. Each installation is *individually designed* to fit the requirements of its specific application—then erected "on the job" under supervision of a Holcroft engineer. Our work ends only after the furnace is operating to meet all requirements for volume and quality of production.

In designing to these requirements, Holcroft engineers are never handicapped by favoritism as to type of heating, furnace construction or mechanism, but select only the features which are *best for the particular application*—frequently devising new and better methods in the process. Thus every Holcroft furnace is *right* for the job—does all that's demanded of it, and with maximum operating economy.

It may pay you handsomely to consult with Holcroft before investing in furnace equipment for production heat treating of ANY kind.

ELECTRIC AND COMBUSTION

Furnaces

BUILT BY HOLCROFT & COMPANY DETROIT-MICH.

SINCE 1916—THE BEST IN DESIGN AND CONSTRUCTION

Holcroft & COMPANY

6545 EPWORTH BLVD. • DETROIT 10, MICHIGAN

CHICAGO 3: C. H. MARTIN, 1017 PEOPLES GAS BLDG. • HOUSTON 1: R. E. McARDLE, 5724 NAVIGATION BLVD.

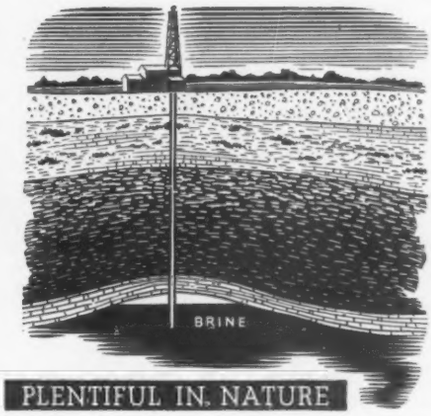
CANADA: WALKER METAL PRODUCTS, LTD., WALKERVILLE, ONTARIO

ONE OF A SERIES ABOUT ALLOYING METALS . . . WHERE THEY COME FROM AND HOW THEY ARE USED

THE STORY OF CALCIUM

BEAUTY WITH UTILITY

1 Buildings of beauty from ancient times to the present day have been constructed of marble. Marble and limestone yield quicklime upon heating. In 1808 Sir Humphry Davy proved that quicklime is not an element but the oxide of a metal, which he named "calcium"—from "calx," Latin for "lime."

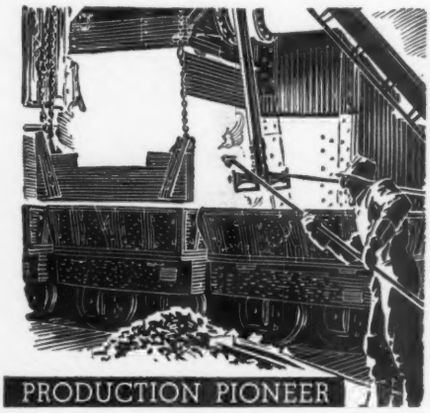


PLENTIFUL IN NATURE

2 Calcium does not occur in the free state, but its compounds are widely distributed—phosphates in bones, carbonates in pearls and coral. Deep brine wells such as found in Michigan are a source of calcium chloride, one of the raw materials available to Electromet for producing calcium metal.

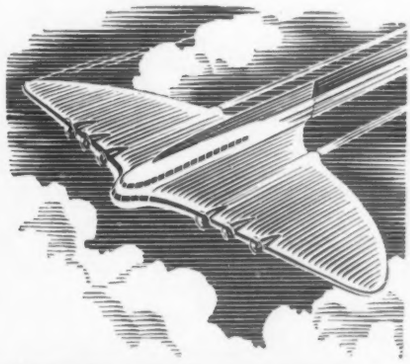
STRANGE CARROT

3 As it comes from the electrolytic cell, calcium metal looks like this "carrot." This soft white metal is extremely reactive. In metallurgy, because of this activity, calcium is used in the preparation of semi-rare metals, the deoxidation and cleansing of copper—and in the production of magnesium alloys.



PRODUCTION PIONEER

4 As early as 1896, a predecessor company of Union Carbide began commercial production of calcium carbide in electric furnaces, making possible the production of acetylene, and from it, many organic compounds. Now, the active calcium metal is also useful in organic syntheses.



ASSETS FOR THE FUTURE

5 Quality aircraft steels require steel of exceptional cleanliness. Calcium metal, as well as calcium alloys, are most efficient for the deoxidation and cleansing of these high-quality steels. Electromet calcium-silicon and calcium-manganese-silicon are eminently satisfactory for this purpose.

Years of Experience

. . . have given Electromet's metallurgists the "know-how" in the manufacture of high-quality steels. With our supply of calcium metal from France cut off by World War II, Electromet's newly developed calcium plant at Sault Ste. Marie went into operation, and now the United States produces many times as much calcium metal as was ever imported. Complete descriptions of Electromet products and service are contained in the booklet, "Electromet Ferro-Alloys and Metals", available by writing our Technical Service Department.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

ELECTROMET Ferro-Alloys and Metals are sold by Electro Metallurgical Sales Corporation and Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

Electromet
TRADE-MARK
Ferro-Alloys & Metals

IF ALL YOUR ALUMINUM CASTINGS AREN'T *Blue Ribbon Babies*

The Alcoa Service Engineer can make suggestions and recommendations that will help you cut down rejects, and get more ready-to-ship castings out of your aluminum ingot inventory.

He may suggest minor pattern changes or a different Alcoa Casting Alloy. Or a change in the spotting of gates and risers. Perhaps your melting procedure or foundry techniques can be improved. Aluminum foundry procedure is his business; his advice can help you make your Alcoa Pig and Ingot go further, with fewer rejects and casting repairs.

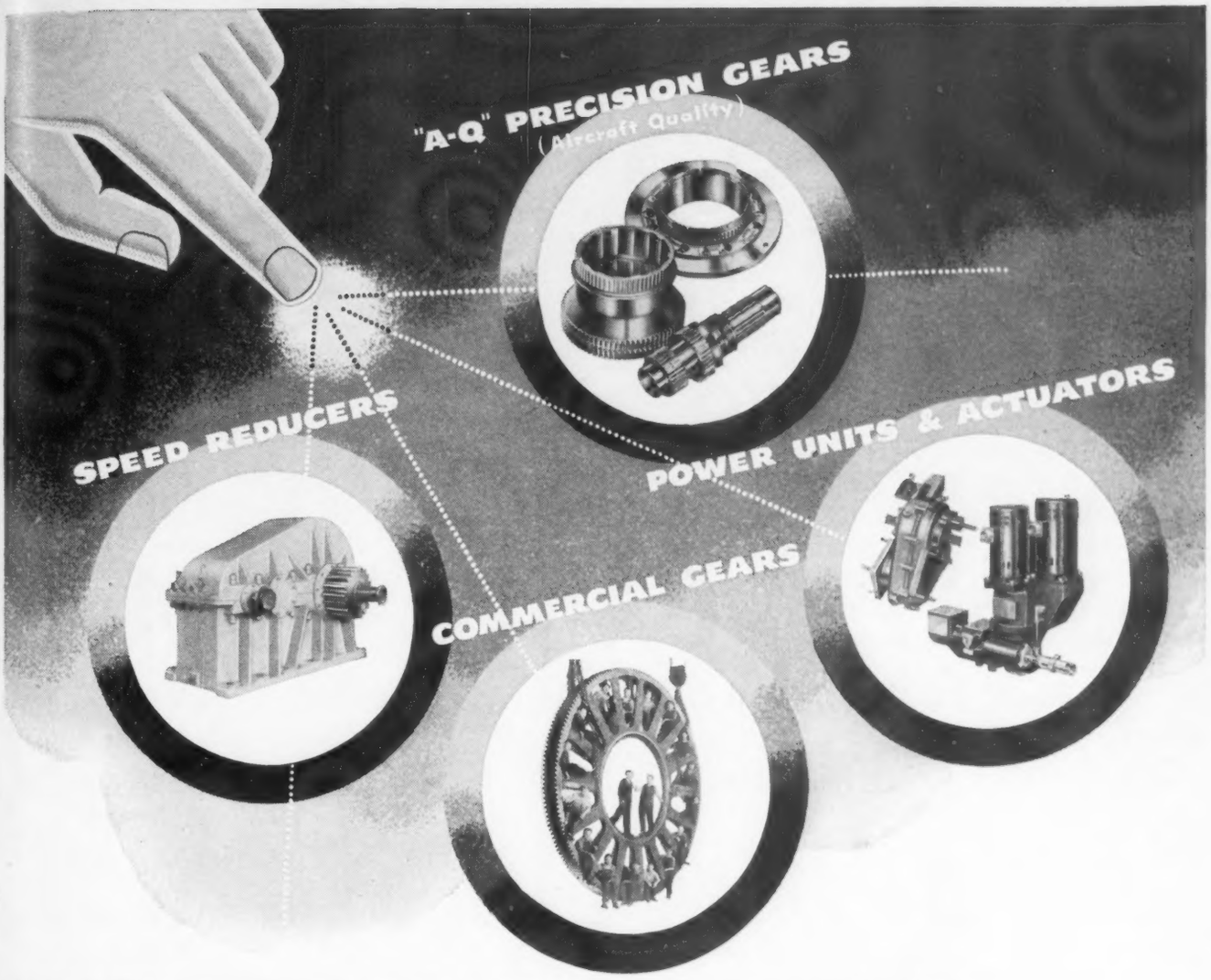
If you need information or technical help on aluminum casting practices, write to ALUMINUM COMPANY OF AMERICA, 2112 Gulf Bldg., Pittsburgh 19, Penna. Or call the Alcoa sales office nearest you.

MORE people want MORE aluminum for MORE uses than ever

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

IN EVERY COMMERCIAL FORM



Whatever your needs in power transmission . . .

Regardless of what your requirements in power transmission may be, Foote Bros. has the engineering staff—the skilled production force—the modern plant facilities—to serve you. And above all, nearly a century of experience in producing such equipment.

Today two large plants—one devoted to the manufacture of precision gears, power units and actuators; the other to the manufacture of industrial gears, speed reducers and special machinery—are serving industry. These facilities include research laboratories, a skilled engineering department and a unique heat-treating department providing absolute control so essential to modern gear production.

Whether it's "A-Q" (aircraft quality) Gears of extreme precision that offer light weight, compactness, high efficiency, capable of excessively high speed; or

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This Erie Double Frame Forging Hammer is shown through the courtesy of Burke Steel Company, Inc., Rochester, N. Y.

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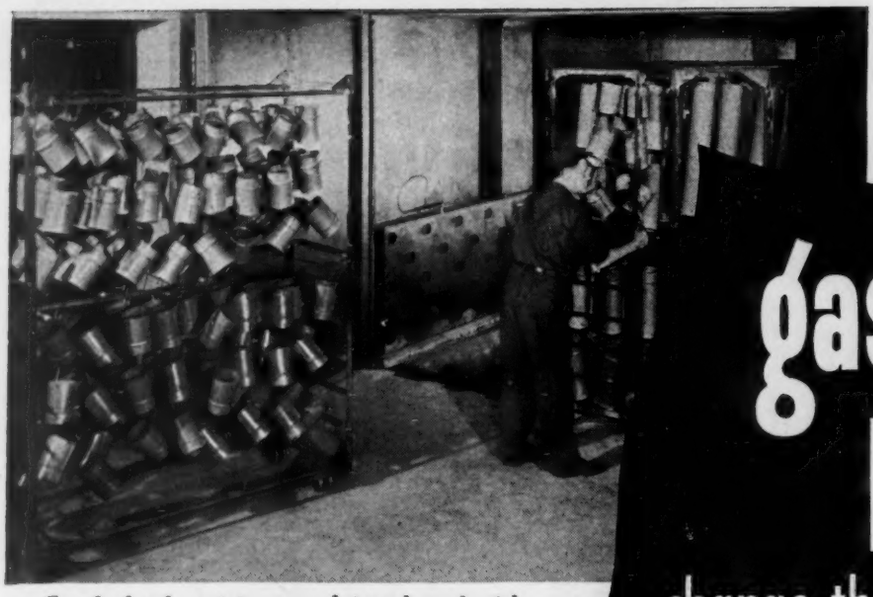

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Plastic coating of metal parts expands the whole field of applications for both metals and plastics. By varying the chemical composition of the plastic an infinite variety of new surfaces can be created for metals.

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Wherever there's a difficult industrial heating problem there's a job for GAS. Don't forget that the Industrial Representative from your local Gas Company will give you up-to-date information on the latest developments of Gas equipment for your heating requirements.

**Photos courtesy of Despatch Oven Co., Minneapolis, Minn.*

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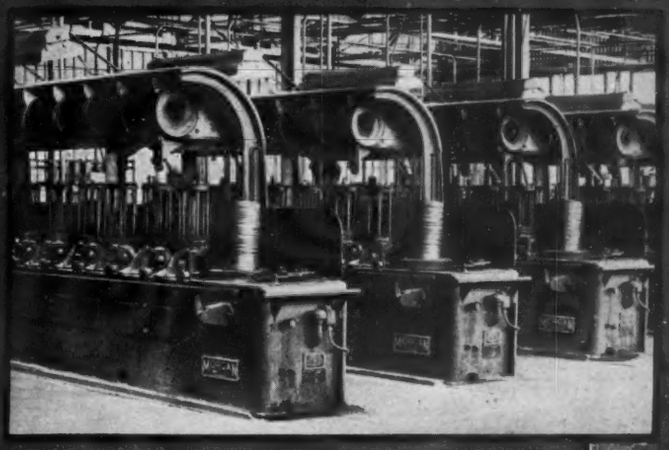

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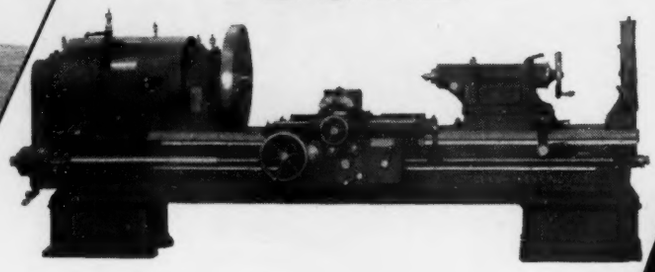
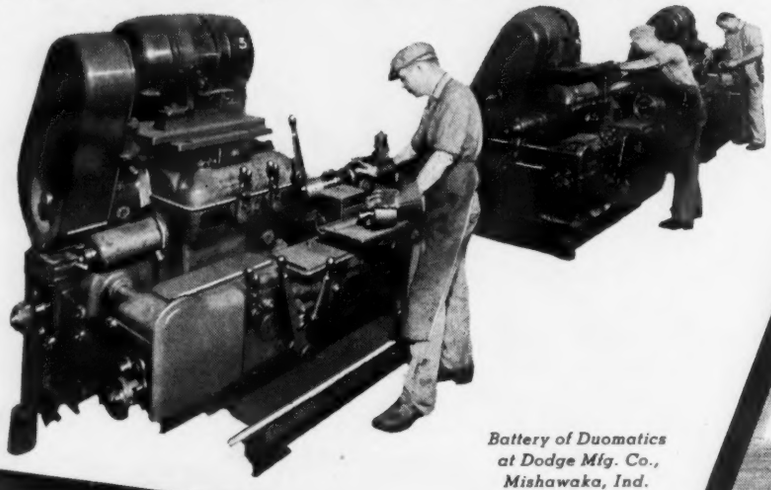


BUT WHAT ABOUT *1946* ?



Battery of Duomatics at Dodge Mfg. Co., Mishawaka, Ind.

DO IT WITH A *DUOMATIC*

● Industry and machine tools have come a long way since the day of the "walrus" mustache. Labor, material costs and other overhead have multiplied many times.

Modern Lodge & Shipley Lathes compensate for these rising costs . . . produce many times yesteryear's snail-pace production. But even lathes just a few years old may be out-of-date measured by today's highly competitive conditions. The true and only standard is profitable production!

Consider the new Lodge & Shipley 2A and 3A Duomatic Lathes. Fully automatic, even on complex, multiple tool jobs, Duomatics step-up production—drastically lower costs. One operator with a Duomatic easily equals the production of several older lathes.

The Duomatic is like a lathe with a "man inside". The unskilled operator merely loads the workpieces, starts the cycle, then unloads when finished. Because there are no cams, cycle changing is vastly speeded and simplified. These and many other features transfer responsibility from operator to machine.

Why not investigate the profit possibilities of Lodge & Shipley Duomatic Lathes? L & S Engineers will be glad to explain these features—demonstrate them on your own work. Write on your company letterhead for Bulletins 634 and 635.

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HANSEN *Couplings*
Are Used On a VARIETY of JOBS

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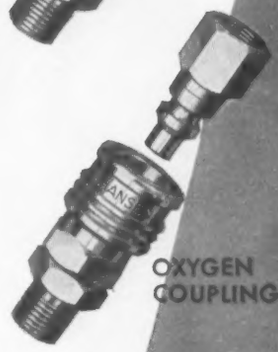

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EACH DAY a new use is found for Hansen couplings, proving their adaptability, versatility and right design. Hansen couplings have made their mark in many fields and their long list of accomplishments is growing longer each day.

There is a specific Hansen coupling made for air, oil, grease, oxygen, and acetylene, and they come in a wide range of standard sizes.

Hansen couplings are simple and easy to operate — merely push plug into socket, coupling is connected and locked — slide sleeve back with thumb, coupling is unlocked and disconnected. Hansen couplings are rugged, with all moving parts fully protected, consequently they will stand up under rough usage. Complete swivel action prevents kinking of hose. They can be readily incorporated in new or existing equipment.

Our representatives will be glad to discuss with your engineers the possibilities and many advantages of Hansen couplings. Send for illustrated catalog.

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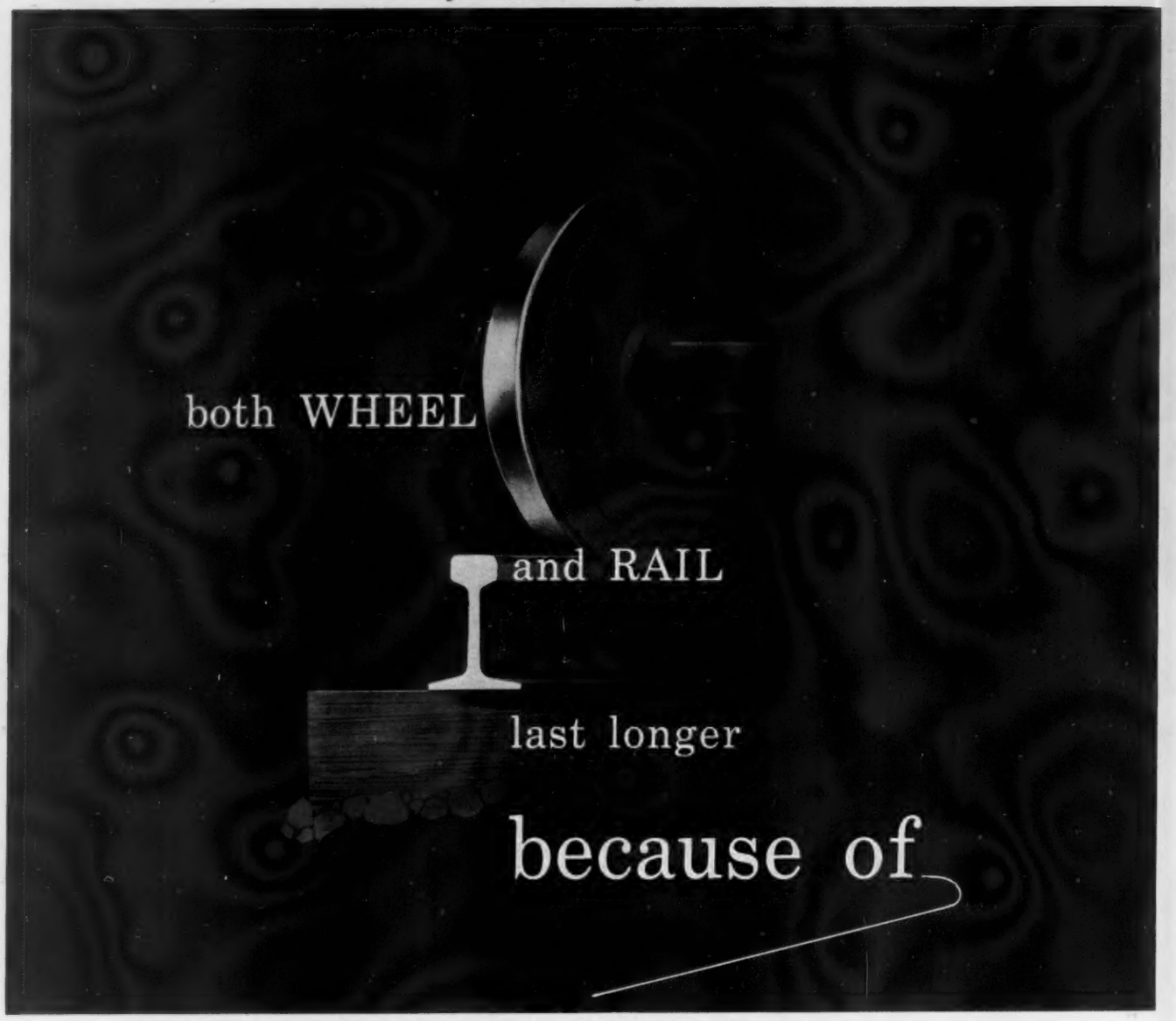

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with a DESPATCH FINISH BAKING OVEN

"How can we increase our daily finishing output without loss of ANY floor space?"

When Marquette Mfg. Co. dropped this question into the laps of DESPATCH engineers a few months ago, the right answer proved to be partly alphabetical—the roof-hugging "A" shaped Finish Baking Oven you see above.

This oven has **boosted Marquette's baking output more than 69% . . . it simplifies handling . . . and ALL the floor-space under the oven is useable.** Ample head-clearance and work area are provided for sanders, assembly benches and two dip tanks—underneath the oven.

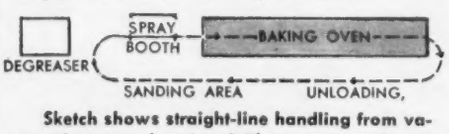
Excellent straight-line, work-saving handling is obtained, too. Material (such as battery charger cases) goes direct from degreaser to oven conveyor . . . through spray booth . . . up and through oven . . . and down to normal level for inspection and unloading.

WRITE FOR FULL STORY of this installation today! Complete details, including print of oven, performance data and other valuable information for your files. Up-to-the-minute facts that may make your finishing job easier.

DESPATCH OVEN CO., 617 S.E. 8th Street, Minneapolis 14, Minn.

PHOTO ABOVE shows Marquette "Hi-Rate" battery charger cases being inspected and unloaded from a Despatch direct gas-fired oven. Note how oven is built close to roof to give added clearance and work area underneath.

Oven is 49 ft. long (overall). Continuous conveyor runs through water-wash spray booth, then rises sharply to enter oven chamber. Material is unloaded at normal working level. Loads are baked from 9 to 25 minutes at 280° to 300° F. Speed of conveyor is adjustable from 18" to 36" per minute.



Sketch shows straight-line handling from vapor degreaser (extreme left) to spray booth and through oven.

Write for Additional Details

DESPATCH OVEN COMPANY

Complete Finishing Systems or Individual Ovens
BAKING OVENS • RUST PROOFERS • DRY OFF OVENS
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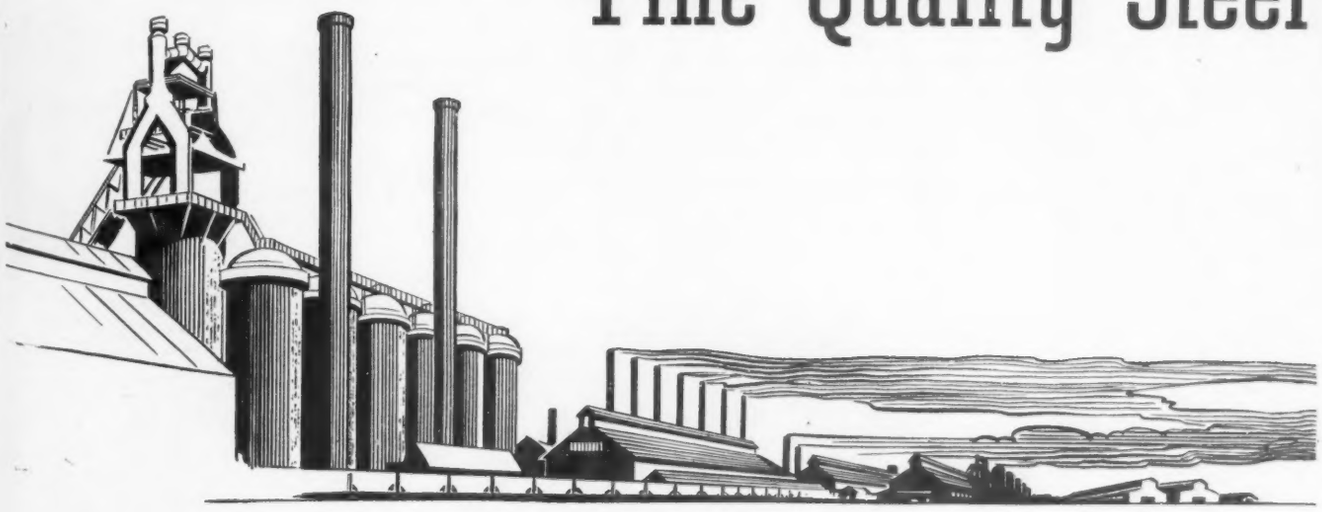
FLOW COATERS • WASHERS

Serving the Middle West and the Nation with Fine Quality Steel



Since 1878, Granite City Steel Company has maintained facilities large enough to permit the use of the latest processes developed by the steel industry... yet small enough to permit the scrupulous attention to manufacturing detail that is necessary to produce steel of the finest quality.

And, since 1878, the manufacturers of the Nation and the Middle West have specified "Steel from Granite City" when they need fine quality steel tailor-made to their own particular specifications. They know that steel from Granite City is finer quality steel.

Granite City Steel Company

GRANITE CITY, ILLINOIS

Chicago • Cleveland
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SINCE
GRANITE CITY STEEL
1878

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automatic shears by HALLDEN

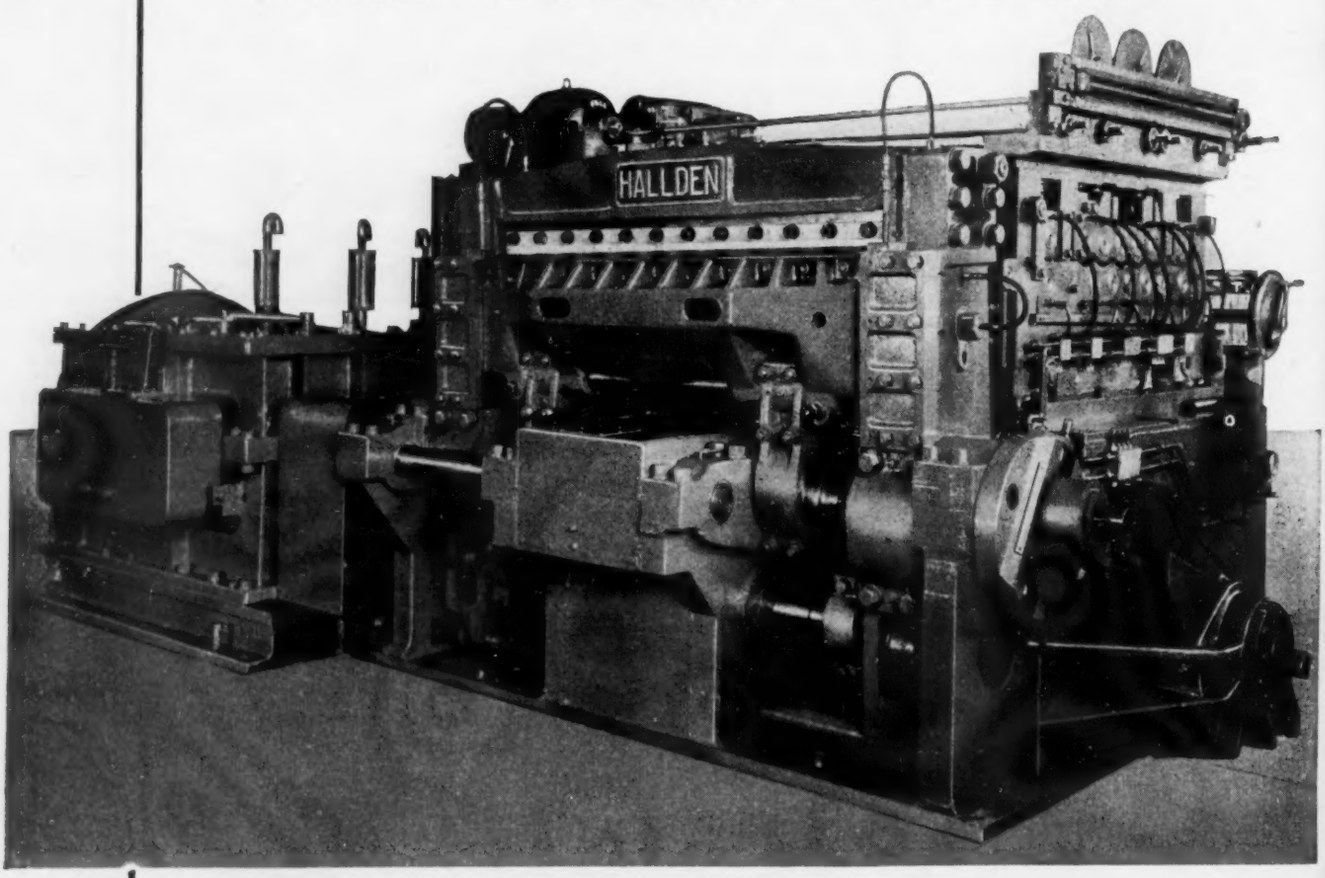
Here's a machine that takes the strip metal from coil, hot bed, or trimmer, flattens it, cuts it accurately into pieces of predetermined length, and piles the pieces neatly upon a conveyor, table or truck. It is a triumph of Hallden engineering.

Consisting of two units, a flattener and a flying shear, it is driven in combination and so timed that during the period of cutting off, the shear moves forward with the exact speed of the metal. The flying shear is a rocker type guillotine design, constructed of a special alloy welded steel. Shear knives are standard type. Each blade has four cutting edges; top and bottom blades are interchangeable, and both blades always move in a mutual plane.

The flattener consists of a 10-roll flattener with two pairs of feed rolls, each roll driven through a coupling. Flattening rolls are constructed of an alloy chrome steel, hardened and ground to a scleroscope of 90. All rolls are easily removed for grinding.

The machine is designed to cut the metal lengths to an accuracy of 1/32 of an inch. Heavy and rugged, with a low center of gravity, it stands up under continuous service without any attention other than oiling. Simple, rugged and entirely automatic, it is very compact and requires little space.

Hallden Automatic Flattening and Cutting Machine for ⅛" Thick Steel Strip No. 56



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SALES REPRESENTATIVES:

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The quality of materials used in making steel and iron is the basis of their ability to meet today's stringent requirements.

The excellent quality of VANCORAM ferro-alloys, consistent from lot to lot, aids manufacturers in the production of steels and irons for maximum performance both in processing and in use.

Our metallurgists will be glad to cooperate with you on specific applications.

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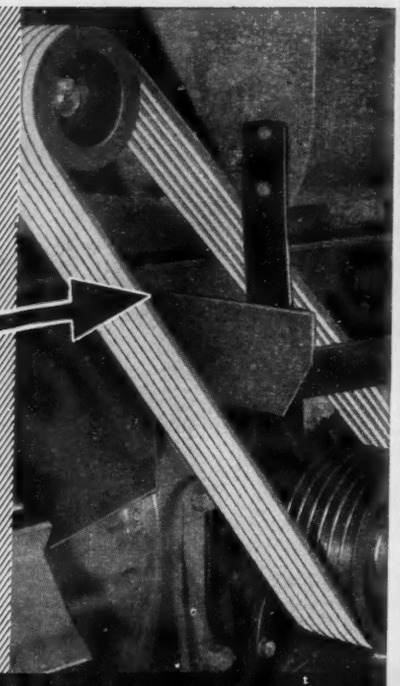
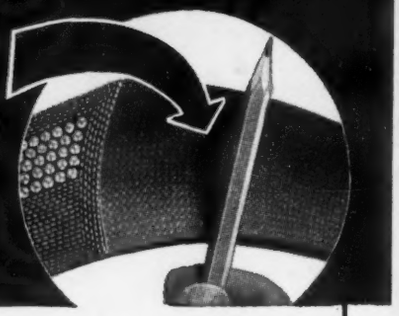
In *ANY* V-Belt It's the *SIDES* That Get the *WEAR!*



The moment you look at a V-Belt in its sheave you see at once that the *sides* of the belt do all the gripping on the pulley and get all the wear against the sheave-groove wall.

Notice, too—it's the *sides* that pick up all the power delivered by the driver pulley. The sides *transmit* that power to the *belt as a whole.* And then, once more, it's the sides—and the sides *alone*—that grip the driven pulley and *deliver* the power to it.

That's Why The FACT That the CONCAVE SIDE (A GATES PATENT) *REDUCES* Sidewall *WEAR* Is IMPORTANT to You!



The fact that the *side* is the part that does the work and gets the wear explains why you have always noticed that the sidewall of the *ordinary* V-Belt is the part that wears out *first.* Naturally, then, when you lengthen the life of the sidewall you lengthen the life of the belt.

The simple diagrams on the right show exactly why the ordinary, *straight-sided* V-Belt gets excessive wear along the *middle of the sides.* They show also why the Patented Concave Side *greatly reduces* sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-Belts can possibly give.

Longer Sidewall Wear Is NOW MORE IMPORTANT Than Ever Before!

Now that Gates Specialized Research has resulted in V-Belts having much stronger tension members—tension members of Rayon Cords and Flexible Steel Cables, among others—the sidewall of the belt is often called upon to transmit to the pulley much heavier loads. Naturally, with heavier loading on the sidewall the life-prolonging Concave Side is more important today than ever before!

THE GATES RUBBER COMPANY, DENVER, U. S. A.

World's Largest Makers of V-Belts

Straight Sided V-Belt

How Straight Sided V-Belt Bulges When Bending Around Its Pulley

You can actually feel the bulging of a straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Gates V-Belt with Patented Concave Sidewall

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt Is Bending Over Pulley

No Bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt!

471

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks **IN ALL INDUSTRIAL CENTERS** of the U. S. and 71 Foreign Countries

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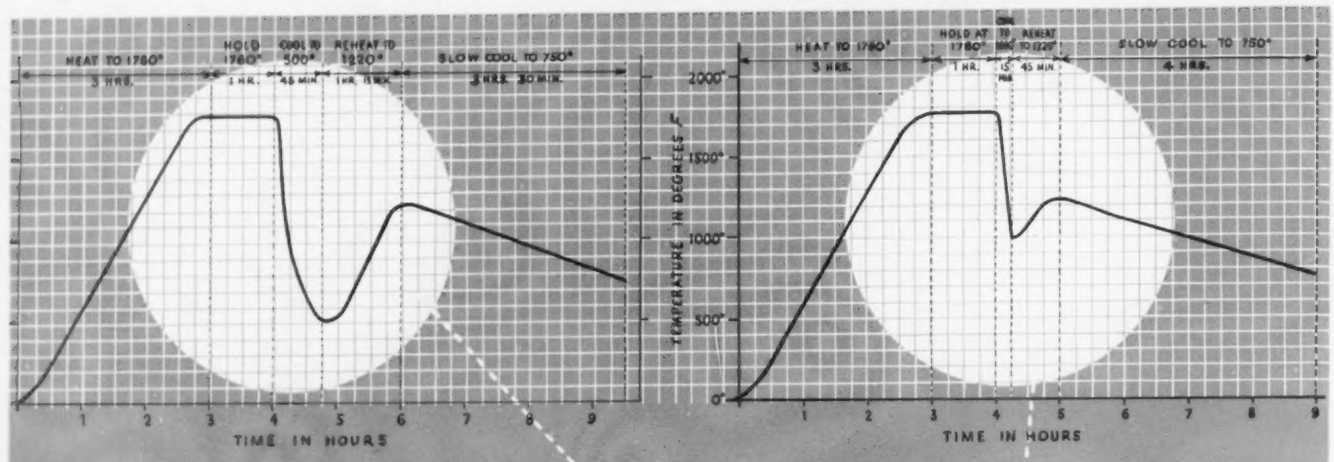
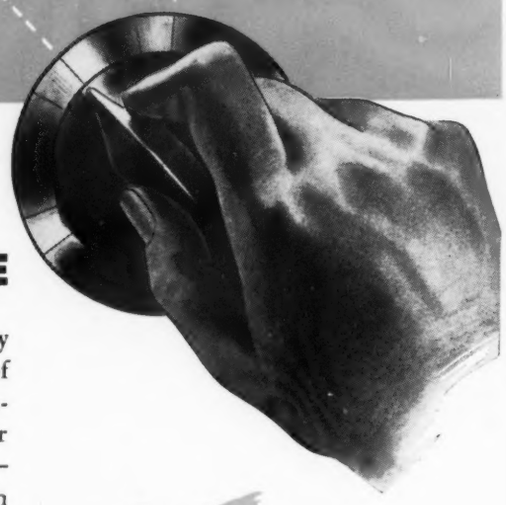
Executive Offices, Pittsburgh, Pa.

NATIONAL STEEL

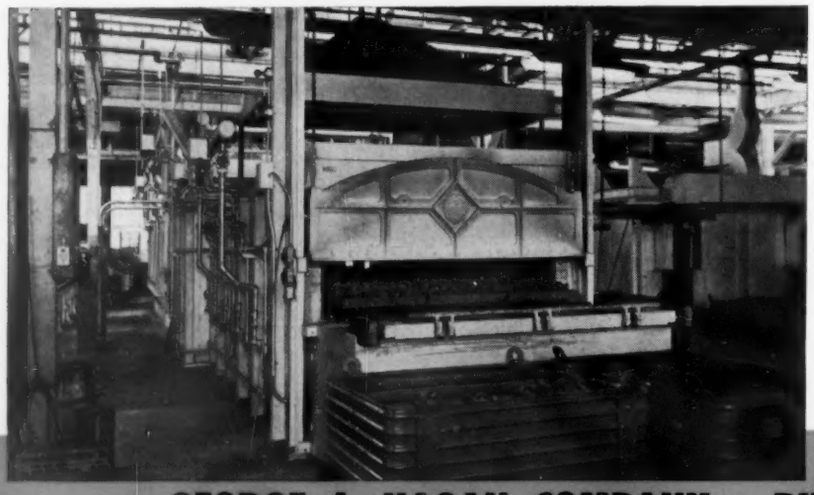


SELECT YOUR FURNACE LENGTH—
DIAL YOUR COOLING CYCLE—
with the turn of a switch!

HAGAN
Automatic
CYCLE ANNEALING FURNACE



Maintain constant production—constant pushing intervals—yet vary your cooling cycle over a range of more than 1100°F. with a turn of a switch. This *exclusive* feature of the Hagan Automatic Cycle Annealing Furnace permits variable quick cooling of forgings or castings from furnace temperature down to 500°F. *in the furnace*—not outside in room atmosphere. For advanced engineering in industrial furnace applications—check *first* with Hagan.



SAME Furnace
SAME Production
SAME Pushing Interval
DIFFERENT Cycles at will!

HAGAN — INDUSTRIAL FURNACES FOR ALL PURPOSES

GEORGE J. HAGAN COMPANY • PITTSBURGH, PA.

DETROIT CHICAGO LOS ANGELES SAN FRANCISCO

SAVE

The No. 8 showing new Wells Wet Cutting System – an economical accessory available for all No. 8 Wells Saws.

✓time

If it's *metal cutting,* move the handy Wells saw to the job. It's portable . . . self-contained . . . versatile! Save the time lost in moving material in and out of metal cutting rooms. Get jobs finished quickly, indoors or out. Reduce shop congestion.

✓manpower

Wells Metal Cutting Band Saws are easy to use . . . quick to set up . . . require little supervision. With a Wells, one man can handle many miscellaneous cutting jobs along with other work.

✓material

The Wells saw does good work . . . cuts close . . . removes minimum stock. Because operation is simple, any shop man can use it safely and efficiently with minimum waste.

✓money

No large capital investment is required for a Wells saw, the machine with many uses. Power operating costs are low. It occupies little floor space and is a profitable utility tool for countless shops. For complete information, send for interesting descriptive literature or see your local Wells distributor.

Wells SAWS
THE SIGN OF SERVICE

Wells

METAL CUTTING BAND SAWS

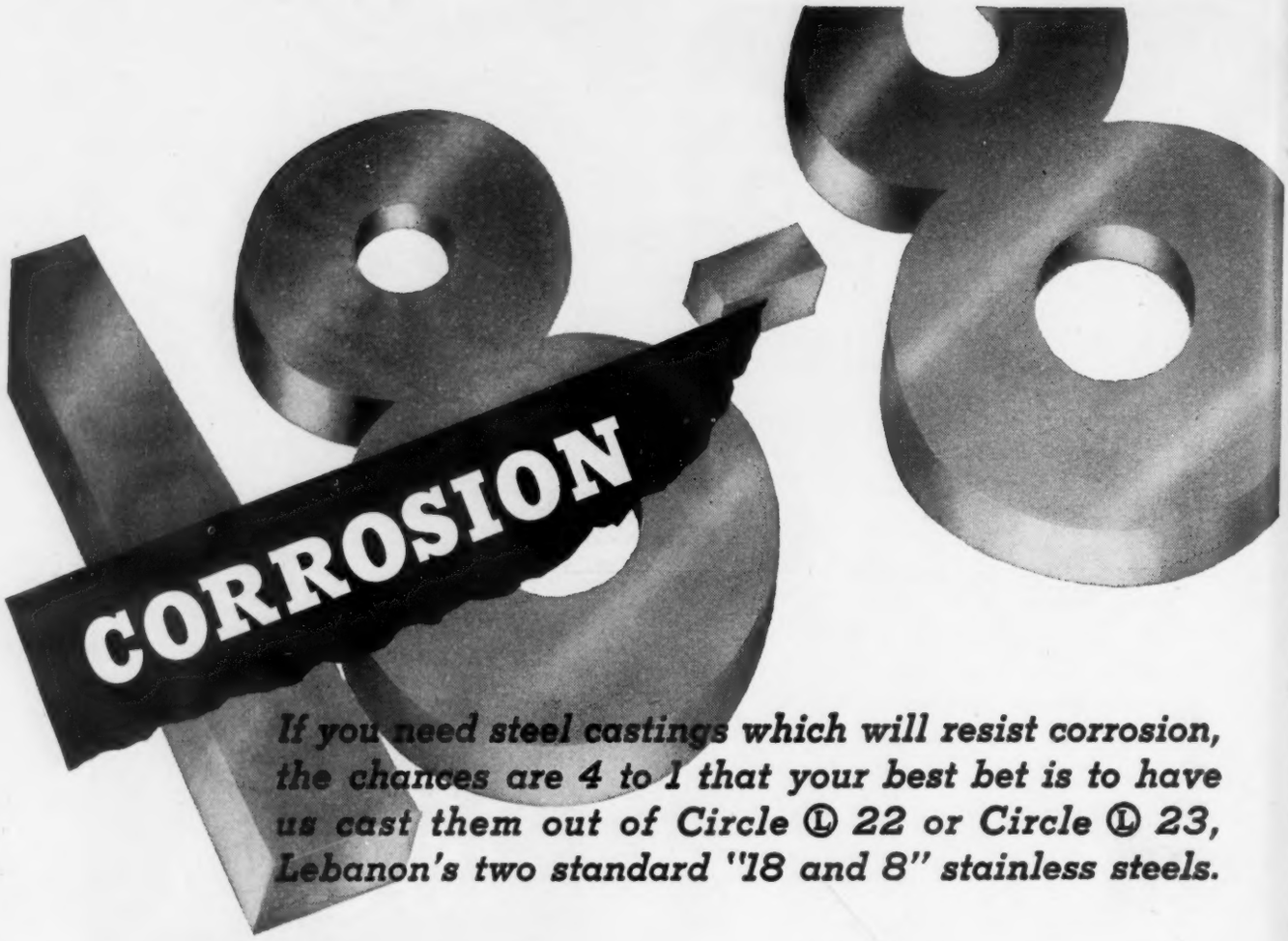
Specifications

CAPACITY:	
Rectangular	8″ x 16″
Rectangular (special guides)	5″ x 24″
Rounds	8″ O. D.
MOTOR	½ H.P., A.C. or D.C.
SPEEDS	Selective 60, 90, 130 feet per minute
WEIGHT	Approximately 665 pounds

WELLS MANUFACTURING CORPORATION

1515 FILLMORE ST., THREE RIVERS, MICHIGAN

Products by Wells are Practical



If you need steel castings which will resist corrosion, the chances are 4 to 1 that your best bet is to have us cast them out of Circle Ⓛ 22 or Circle Ⓛ 23, Lebanon's two standard "18 and 8" stainless steels.

20 YEARS ago Lebanon began producing electric furnace castings of the "18 and 8" stainless alloys. Since then, they have proved their value under such a wide variety of service conditions that they have become known as the workhorses of the corrosion resistant alloys. Today they represent about 75% of the production of the Lebanon Steel Foundry's alloy output. This in spite of the fact that Lebanon has constantly pioneered the way in developing new alloys for special conditions.

Circle Ⓛ 22 and 23 are identical in analysis except for a lower carbon content in the former which makes heat treatment after welding unnecessary. The normal analyses and physical properties of these two alloys are summarized below. For more complete information write for our technical bulletin.

LEBANON STEEL FOUNDRY • LEBANON, PA.

"In The Lebanon Valley"

ORIGINAL AMERICAN LICENSEE GEORGE FISCHER (SWISS CHAMOTTE) METHOD

LEBANON CIRCLE Ⓛ 22 AND 23

Lebanon Designation	NOMINAL ANALYSES							NOMINAL PHYSICAL PROPERTIES			
	C.	Si.	Mn.	Cr.	Ni.	Mo.	Special	Tensile Strength	Yield Point	Elongation in 2"—%	Brinell Hardness
Ⓛ 22	0.07 Max.	1.25	0.75	19.50	9.00			75,000	36,000	50	135
Ⓛ 22-M	0.07 Max.	1.25	0.75	19.50	9.00		Se. 0.25	80,000	40,000	45	160
Ⓛ 22-XM	0.07 Max.	1.25	0.75	19.50	10.00	2.25		82,000	42,000	50	170
Ⓛ 23	0.20 Max.	1.25	0.75	19.50	9.00			75,000	36,000	45	140

Lebanon CIRCLE L **ALLOY AND STEEL Castings**

Get the Facts.. on the NEW Motch & Merryweather No. 00 CIRCULAR SAWING MACHINE

FOR THE SAWING OF METAL 1/4" TO 2" DIAMETER

Triple-Chip METHOD

No. 00 AUTOMATIC COLD SAW

You can now enjoy the proven superiority of the Motch & Merryweather Triple-Chip Method in the circular cold sawing of metal, ferrous and non-ferrous, up to 2" diameter. The new No. 00 Automatic pictured here has the fundamental advantages of the larger Motch & Merryweather machines, together with important new features. You get speed, smooth cuts and freedom from burrs that often eliminate secondary operations, solidity and rigidity which mean long life and continuous profit-making. In many cases you can eliminate milling cut-off operations. Four models to meet every requirement:

AUTOMATIC · SEMI-AUTOMATIC · POWER FEED · MANUAL

Ask for your copy of our new, well illustrated 12-page Bulletin "S-1."

Only M & M builds ALL 3: COLD SAW SAW BLADE BLADE GRINDER

Also...

THE No. 2
Circular Sawing Machine for stock up to 6 inches

THE No. 3
Circular Sawing Machine for stock up to 10 inches

THE No. 4
Circular Sawing Machine for stock up to 16 inches

Write for our Bulletins on these machines, too.

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING CLEVELAND 13, OHIO

Here's Why

Experienced Open Hearth Men depend on the Original Dead-Burned Dolomite because it is consistently

5 ways better
COMPOSITION
QUALITY
STRENGTH
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ITS superior natural chemical composition and properly burned grain size particles insure minimum maintenance and repairs.

MAGDOLITE!

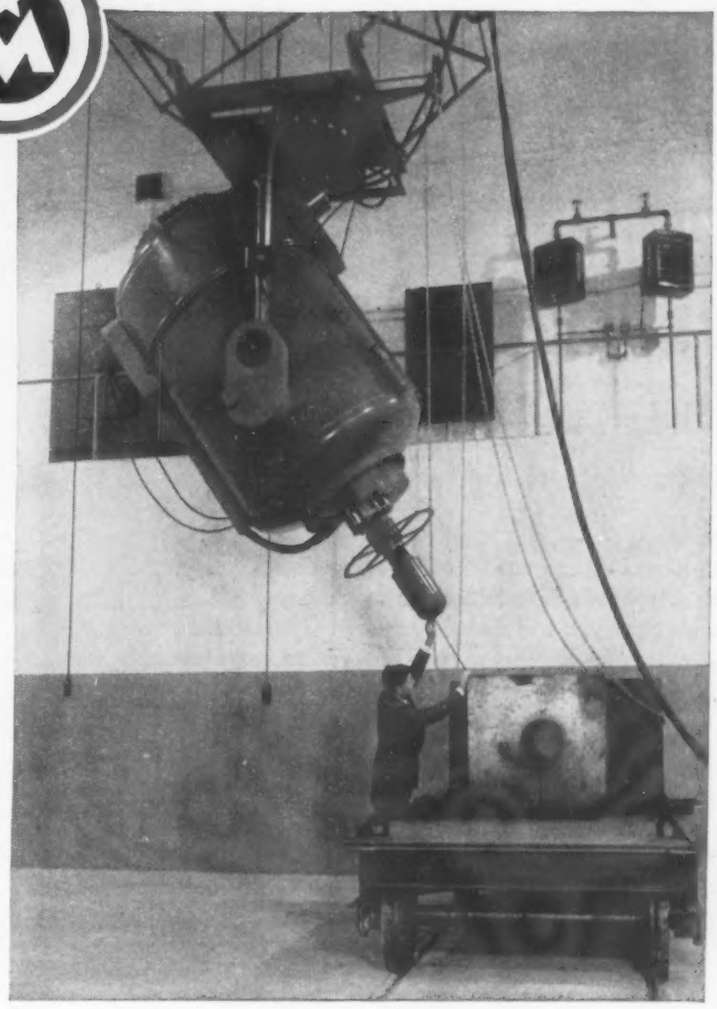
THE J. E. BAKER COMPANY

BILLMEYER, PA. YORK, PENNSYLVANIA MILLERSVILLE, OHIO

Magdolite • Low Silica Limestone • Chemical Lime • Fluxing Lime

You're always SAFE with BAKER'S MAGDOLITE

OUR 2,000,000 VOLT ELECTRIC EYE



MIDVALE'S 2,000,000 volt X-ray tube is the only one of its size in use in any steel mill—a distinction indicating Midvale progressiveness, and soundness of inspection methods. This powerful eye pierces steel 12 inches thick . . . pictures the interiors of forgings, castings and other products . . . points out faults or perfection. And does it faster and surer than equipment of lesser voltage. You can lower the cost of your products—prove their quality and design—by *non-destructive* inspection, with Midvale's penetrating 2,000,000 volt X-ray eye.

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Custom Steel Makers to Industry

STAINLESS AND TOOL STEEL BARS
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CORROSION AND HEAT RESISTING CASTINGS
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FORGINGS AND RINGS

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High Speed... Tool... Die
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Whether you are looking for the most efficient cutting tool, hints on improved die design, a special corrosion-resisting steel, the best stainless for machining followed by welding, or the right steel for a time lock encasement, Crucible has it; and the data is here.

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The metal-working man's basic library . . . *yours for the asking.*

1 ***Steel Analyses*** — Handy twelve-page wall chart, 8½ x 11, listing analyses of leading Crucible Steels, with AISI and SAE numbers, and heat-treat, quench, and temper data on all high speed, tool and die steels.

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3 ***Tool Steel for the Non-Metallurgist*** – A complete discussion of the several types of tool steels, their qualities, and suggestions for their heat treatment, quenching, and tempering. A thirty-two-page book that is easy to understand. Full of useful information.

4 ***Rex High Speed Tool Bits*** — An eight-page folder giving the characteristics and applications of the Rex line of high speed tool bits, with useful suggestions on tool grinding included.

5 ***Crucible Warehouse Stock Book*** — Lists the full range of steels — high speed, tool, die, alloy, stainless, machinery, special purpose — available from Crucible's nationwide warehouse network. Contains working instructions, tables, and other material helpful in specifying, heat treating, and use of these steels.

6 ***Data Sheets*** — Individual four-page data sheets, punched to fit standard 3-ring binder, are available on a full range of grades under each of the following types of steels. Tabbed manila separator sheets are available for each section.

HIGH SPEED STEELS
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Die Casting Die Steels
Plastic Molding Steels
AIR HARDENING TOOL STEELS
OIL HARDENING TOOL STEELS
WATER HARDENING TOOL STEELS
ALLOY STEELS
MACHINERY STEELS

These data sheets contain complete information on type of steel, uses, critical temperature, forging, annealing, hardening, tempering, and hardness, together with complete time-tempering-transformation curves. You should have in your working library the data sheets on all the types of steels you use.

Phone your nearest Crucible branch warehouse for one or all items (phone numbers on opposite page), or mail the coupon to Crucible's New York office.

CRUCIBLE STEEL COMPANY of America
"FULL-RANGE" QUALITY STEELS for INDUSTRY
High Speed • Tool • Stainless • Alloy • Machinery Special Purpose Steels

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Kindly send me free copies of the following Crucible literature: (Check numbers corresponding to illustrations and descriptions above.)

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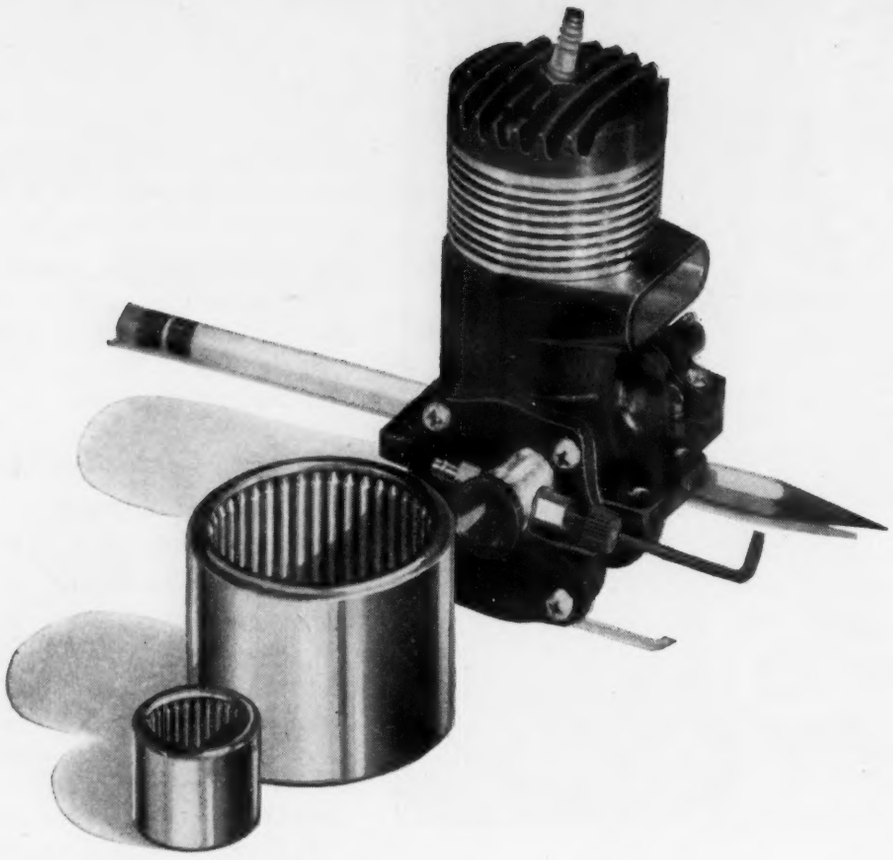

Compact design...

can streamline appearance, increase operating efficiency, cut costs of material, handling and shipping. Your product may benefit by a product-design improvement which

Saves space and weight.

Through the use of Torrington *Needle* Bearings you gain many advantages. In addition to compact design, Needle Bearings have high unit capacity; have low co-efficient of friction; are efficiently designed for lubrication; are easy to handle and install; and are not only low in initial cost but promote many other economies in production and in service.

Just write us, outlining your problem and we'll be glad to work with you in selecting the right type for your requirements.

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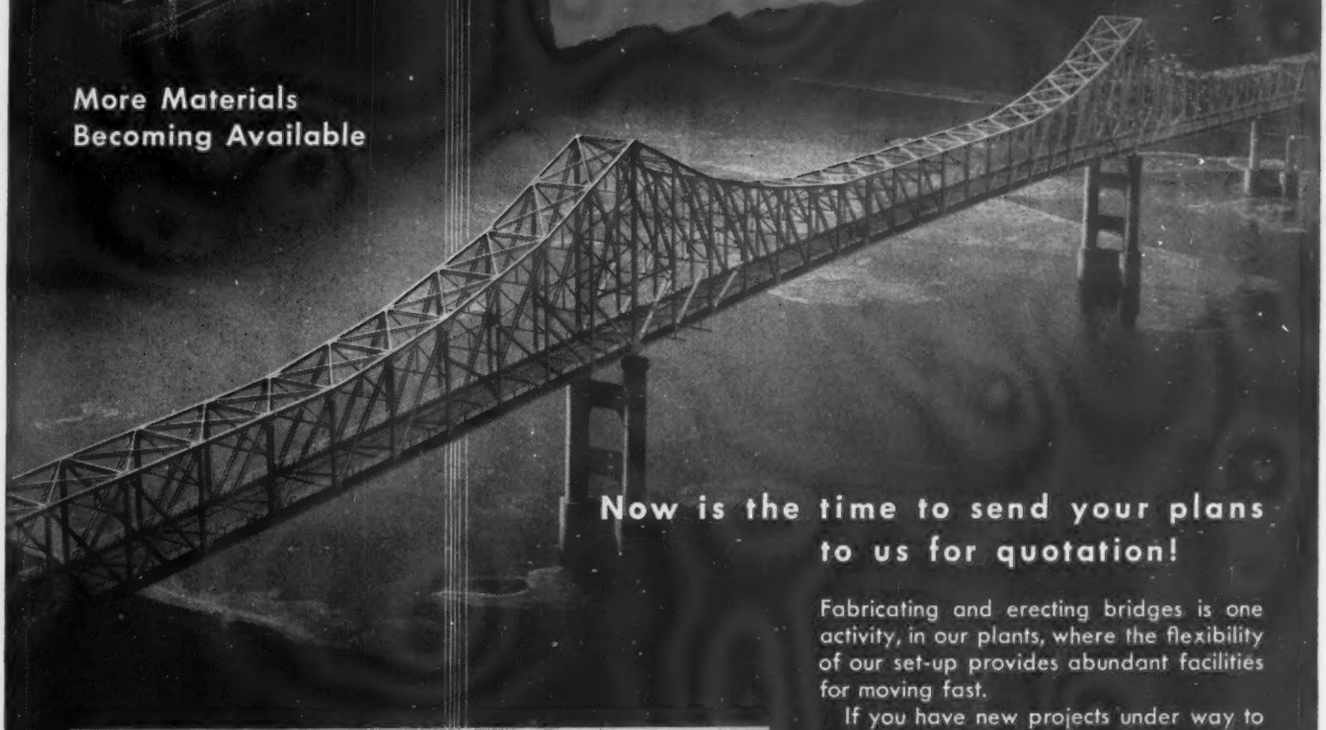
More Men Available

More Materials
Becoming Available

...and 3 Plants
Operating as One.

Fabricators and Erectors
of Structural Steel



Now is the time to send your plans to us for quotation!

Fabricating and erecting bridges is one activity, in our plants, where the flexibility of our set-up provides abundant facilities for moving fast.

If you have new projects under way to be figured, send us the specs when they are ready.

Fabricating the structural steel and erecting highway bridges is just one of our activities. We also fabricate and erect structural steel for all types of buildings . . . industrial plants, public buildings, churches, apartments, stadiums, and so forth.

Every job gets away to a fast start. The steel has a habit of arriving promptly on location. And our erecting crews are expert in getting the structure up. It will pay you to investigate all of the advantages you have at Allied where 3 plants operate as one huge fabricator.

ALLIED "to Win in War or Peace"

STRUCTURAL STEEL COMPANIES

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ENGINEERS
FABRICATORS (75,000 TONS CAPACITY)
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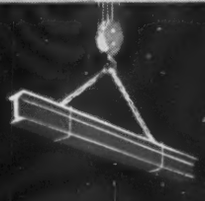
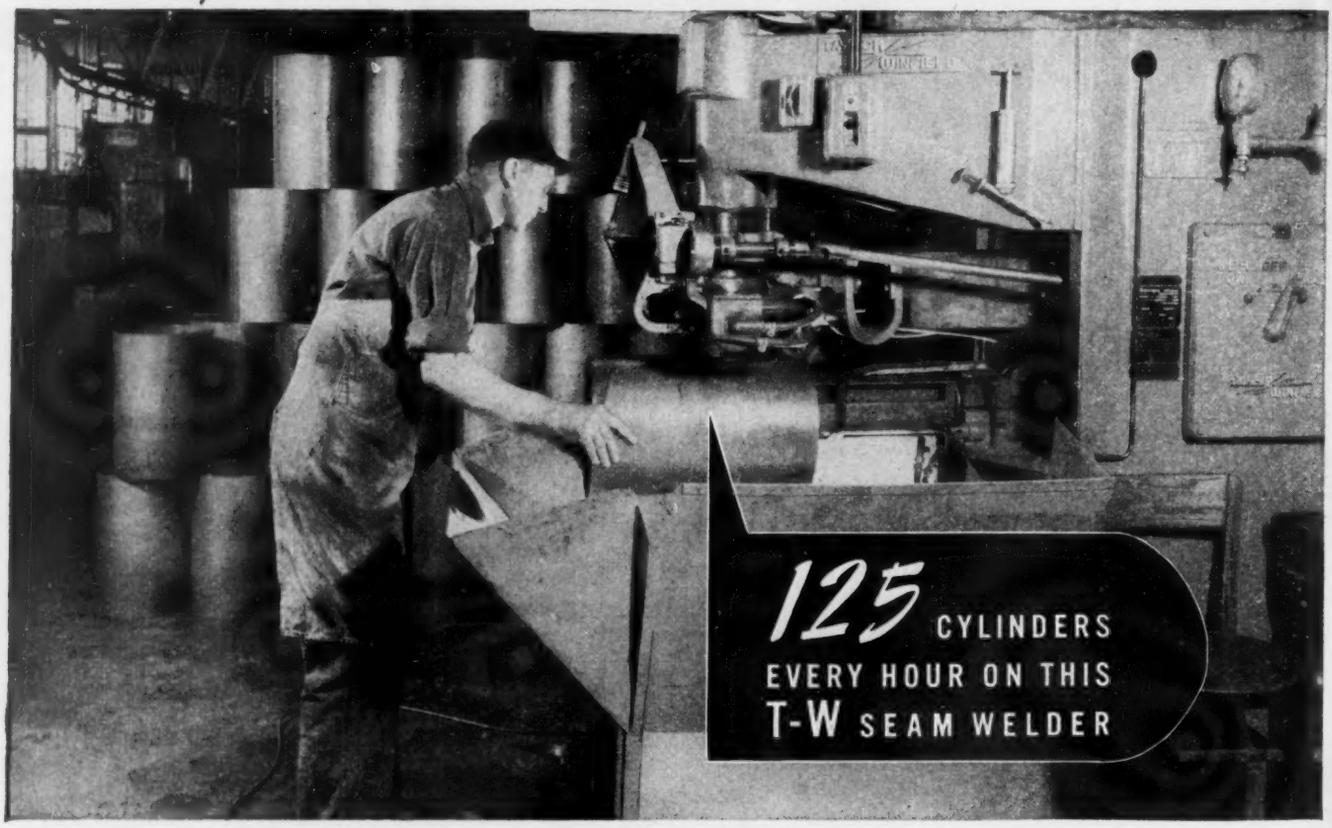


(Reproduction of Advertisement appearing in Fortune Magazine)

Multiplicity of Equipment Breaks Bottlenecks Wide Open!

T/W -----SEAM WELDING----------

FASTEST PRODUCTION METHOD OF MAKING PRESSURE-TIGHT JOINTS



"We have found seam welding a practical and efficient method of fabricating cylindrical containers, particularly where large volume production is necessary."... The Aro Equipment Corporation, Bryan, Ohio.

Taylor-Winfield makes seam welders in many sizes... throat depths 18" to 60"... transformers 50 to 500 KVA. Write or phone Taylor-Winfield for interesting production data based on your products.

When you want to join metal like this or this or any number of different shapes, you can do it faster and better on a production basis with seam welding.

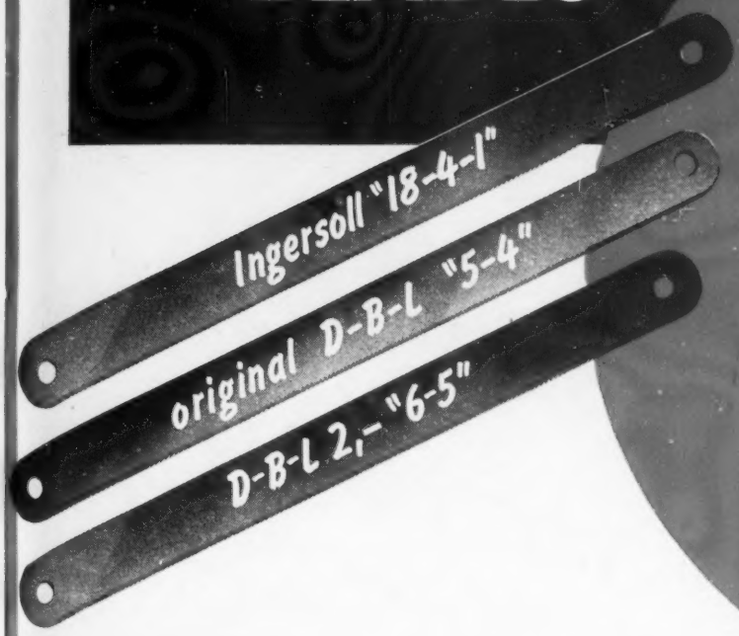
You can seam weld, either circumferentially or longitudinally, as slow as 12" per minute or as fast as 360" per minute. You can space the welds intermittently or overlap them to produce a pressure-tight seam. Either way, the Taylor-Winfield Seam Welder will turn out the same quality of weld time after time, hour after hour, day in and day out... automatically.

On products requiring both circumferential and longitudinal seams, Taylor-Winfield can equip your welder with swinging lower arms and a swiveling upper head. Then you can switch easily from one operation to another.... Just as you can seam weld many different shapes of products, so can you seam weld many different metals... carbon and stainless steels, zinc and other coated steels, nickel alloys, weldable bronzes and aluminum.

Try this fast production method. Taylor-Winfield sales engineers can give you all the facts and figures on seam welding or any of the other forms of resistance welding... spot, flash-butt or projection. Write or phone Taylor-Winfield.

The TAYLOR-WINFIELD CORPORATION
WARREN . . . OHIO

These Steels *take the* "HACK" OUT OF HACK SAW BLADES



When you order hack saw blades from your regular supplier, make it a rule to specify blades made of "Ingersoll 18-4-1" or of "Ingersoll D-B-L." Both are steels that really take the "hack" out of hack saw blades. That's why blades made of these Ingersoll steels are being used today in so many shops and plants all over America.

Ingersoll "18-4-1" Steel is again available to blade makers. Where "D-B-L Blades" are preferred, remember only Ingersoll has had a 6-year record in the successful production of this steel which insures blades with tough cutting edges, high impact resistance and relative freedom from decarburization.

INGERSOLL "18-4-1"

INGERSOLL D-B-L*

INGERSOLL *Steel Division*

Borg-Warner Corporation • New Castle, Indiana

Plants: New Castle, Indiana • Chicago, Illinois • Kalamazoo, Michigan

*Furnished in the original D-B-L Regular, -"5-4" and D-B-L 2, -"6-5".

ENGINEERING B-W PRODUCTION

INGERSOLL *Special Steels for Special Uses*

Alloy Steels
Armor Plate
Clutch Plate Steels
Tillage Steels
Soft Center Steels
Shovel Steels
Knife Steels
TEM-CROSS Steel
IngAclad (Stainless-Clad Steel)
Stainless Steels and Saw Steels, including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels

• Here's the inside story of another application of Latrobe's DESEGATIZING process...*this time to Die Steels*

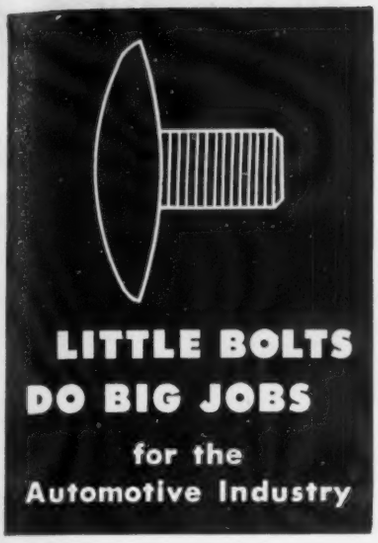
THE four grades of Latrobe's High Carbon-High Chrome Die Steels, now made with the exclusive *Desegatizing* Process, are described in this new booklet, just off the press!

In it you'll find page after page of interesting photographs and photomicrographs of both standard and *Desegatized* Die Steels, giving you an opportunity to compare and see the difference. Every buyer of die steels should have a copy. Write today.

LATROBE
DESEGATIZED
High Carbon · High Chrome
DIE STEELS

7

LATROBE ELECTRIC STEEL COMPANY • LATROBE, PENNSYLVANIA

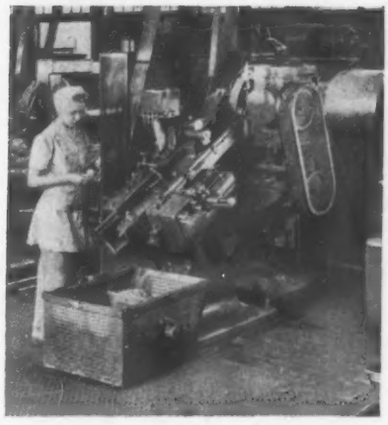


LITTLE BOLTS DO BIG JOBS

for the Automotive Industry

One of the world's greatest, most progressive industries, the American automotive industry is a tremendous purchaser of nuts and bolts of all sizes and shapes . . . standards and specials. Typical are the bumper bolts (illustrated) . . . small but obviously vital fasteners . . . produced by Buffalo Bolt Company for one of our nation's largest manufacturers.

Standard or special, all circle Ⓑ products have the same uniform controlled quality that serves to make your production more efficient . . . less costly.



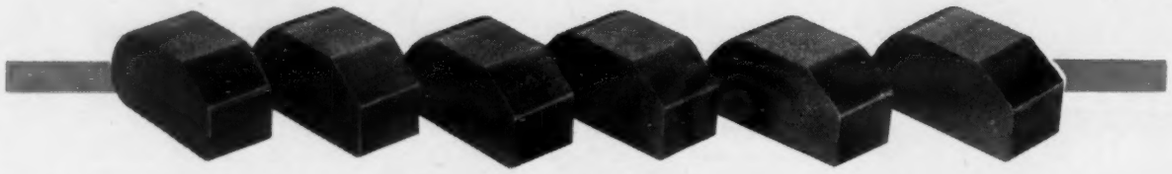
DID YOU KNOW *that each machine in this battery of Buffalo Bolt roll threaders has a capacity of 43,000 bolts per working day?*

Ⓑ BUFFALO BOLT COMPANY

NORTH TONAWANDA, N. Y. · SALES OFFICES IN PRINCIPAL CITIES

Export Sales Office: Buffalo International Corp., 50 Church Street, New York City

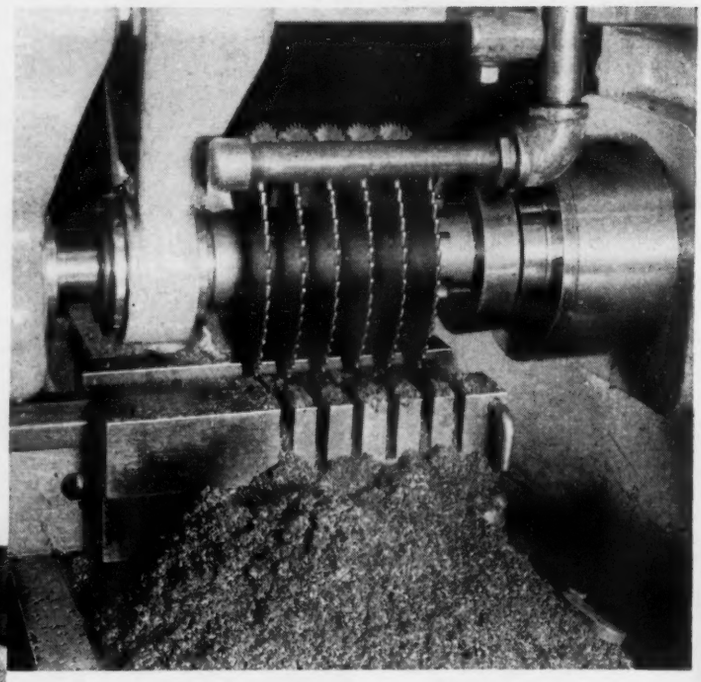
CUSTOMER REPORTS *Less* BREAKAGE *Fewer* SHARPENINGS WITH BARBER-COLMAN STANDARD MILLING CUTTERS

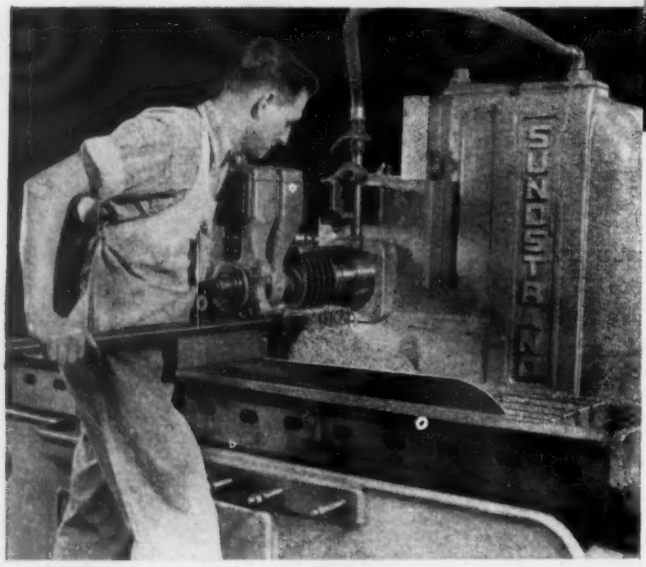


5000 PIECES PER SHARPENING ... NO BREAKAGE ... MILLING TOUGH NE-8617 STEEL WITH HARD SPOTS

These Barber-Colman Standard Metal Slitting Saws ... delivered from stock ... demonstrate low-cost, quick-delivery advantages of using Standard Cutters on short-run, high-production jobs.

The problem called for producing pressure lever dogs faster, and at lower cost by reducing the number of operations required. These were previously cut off as raw stock and then finish machined. Now formed steel bars are fed through a special fixture where a gang of six B-C Standard Saws cut off accurately to size 5 completed dogs per load. Cutting time is 2 minutes per load, and at the time this data was compiled, 5000 pieces had been machined without cutter breakage or resharpening.





Similar results can be obtained on your milling problems with Barber-Colman Standard Cutters. For those short-run, fast production jobs, specify Barber - Colman STANDARD. Be sure of low cost, quick delivery, and dependable performance.

WRITE TODAY— for Machinability Table and Cutting Oil Guide for use with Standard Cutters; also prices, sizes, feeds and speeds. Ask for Sheet No. 34 and Catalog LC.

BRIEF JOB FACTS

Cutters — Gang of B-C Standard Metal Slitting Saws, 8" dia. x 1/8" face x 1 1/4" hole.
Material — NE-8617 Steel, carburized — hard spots.
Operation — Cut-off milling 5 Pressure Lever Dogs per load; size of cut 3/8" x 1 3/8" x 2 1/16" long.
Feed — 2" per min. Speed — 95 S.F.M.
Cutting Time — 2 min. per load of 5 pieces.
Tool Life — 5000 pieces machined; no breakage; Cutters had not required resharpening.

MODERN MACHINES WITH ORDINARY CUTTING BARBER B-C COLMAN **TOOLS ARE NOT FULLY EFFICIENT**

Barber-Colman Company

GENERAL OFFICES AND PLANT 121 LOOMIS STREET ROCKFORD, ILLINOIS U.S.A.

This 84-inch BAILEY THERMAL VALVE

Installed—April 1, 1930, removed from gas main for repairs July 31, 1946. Average operation—30 times per month.

NEVER FAILED TO OPERATE

in 16 years of service!

This Valve never failed to operate every time a tuyere was changed and at every shut-down.

Tonnage produced on furnace in 16-year period—5,800,000 Tons.

FOR THE SAFETY OF YOUR WORKMEN USE BAILEY GOGGLE VALVES

It pays to install them and take care of them!

LEADERSHIP THROUGH QUALITY

WILLIAM M. BAILEY COMPANY *Engineers* **PITTSBURGH 22, PA.**

RULE OUT *Wasted time*

Too narrow a face on a grinding wheel can mean too much time on the job. Why use a wheel with a 1″ face, for instance, when one with a width of 1½″ to 2″ can increase surface contact 25 to 50%? This time saving efficiency is yours in the complete line of Simonds Abrasive wheels. Whether for rough snagging or for precision finishing there is a Simonds wheel to measure up to your most exacting requirements for maximum production with speed and efficiency. A copy of the Simonds Abrasive Data Book is available to guide your selection. Write for yours today.

For assistance in requisitioning consult Simonds Abrasive distributors located in all principal cities.

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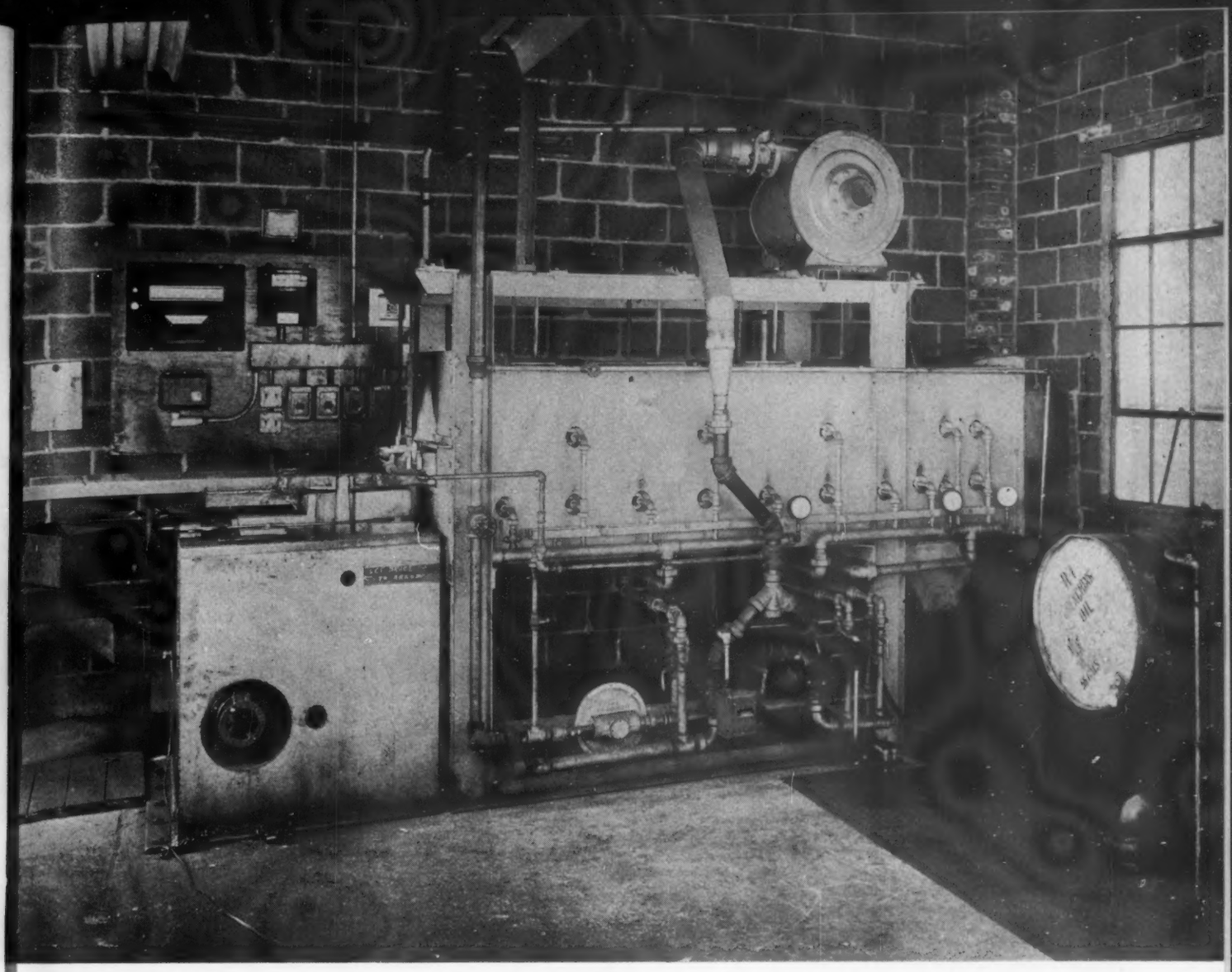


Reciprocating Heating Machine in the Plant of Well-Known Hardware Manufacturer.

VERSATILE RECIPROCATING HEATING MACHINES SUITED TO WIDE VARIETY OF PROCESSES AND PRODUCTS

VERSATILITY is an outstanding characteristic of A.G.F. Reciprocating Heating Machines, which are suited to continuous clean hardening, annealing, normalizing, case-hardening by the patented Ni-Carb process, and many other types of work.

AMONG USERS are manufacturers of bearings, screws, lock washers, tools, wrenches, flat and coil springs, steel writing pens, and many others. Commercial heat treaters especially favor Reciprocating Heating Machines because these machines are able to handle the many varied and different jobs daily received in a general heat-treating shop.

Engineering representatives are available in principal cities. Consult your local directory.

THE RECIPROCATING MUFFLE advances work through the heat by its own momentum. The complete elimination of conveying mechanism from the heating chamber reduces maintenance problems and heat losses to a minimum. There is no traveling belt to be alternately heated and cooled—only work enters and leaves the machine.

MANUFACTURED IN FIVE SIZES, Reciprocating Heating Machines have capacities ranging from 10 to 1200 pounds of work per hour. Write for detailed literature on these machines and other types of heat-treating equipment.

AMERICAN GAS FURNACE CO.

Elizabeth, New Jersey

AMERICAN GAS FURNACE CO. PIONEERS 1878

How a Thermit Weld is Made

Thermit welding was introduced more than 40 years ago. Now an accepted process—it is regarded as the standard method of joining very heavy sections and of welding rail on street railway systems. The Thermit process differs from other fusion welding methods in that it deposits in bulk—all at one time—a quantity of molten metal sufficient to complete the weld. This weld metal—known as Thermit steel—can be produced in varying compositions, making it possible—in most instances—to match the chemical and physical properties of the parts to be joined.

Thermit welding is made available in three ways: (1) it may be done by your own crew in your plant after instruction by one of our engineers; (2) parts can be shipped to us; or (3) we can do the work in your plant.

Contact our nearest office today and get the complete story on this time-and-expense-saving process. Metal & Thermit Corporation, 120 Broadway, New York 5, N. Y., Albany, Chicago, Pittsburgh, So. San Francisco, Toronto.

MAKING THE WELD

1. A mold box of sufficient size is constructed around the section to be welded. (The size of a Thermit weld is governed only by the limitations of mold construction.)

2. The parts to be welded are pre-heated to a red heat. During pre-heating a crucible is placed in position and filled with the desired Thermit mixture.

3. The mixture is ignited and the Thermit reaction takes place. In Fig. A, the reaction has occurred and the crucible is ready for tapping.

4. In Fig. B, the crucible is tapped, allowing the Thermit steel to fill the mold completely—thus preventing oxidation.

5. The pre-heated metal fuses with the fluid metal, Fig. C. Cooling takes place at a uniform rate throughout with only one shrinkage. Hence, serious internal stresses are eliminated.

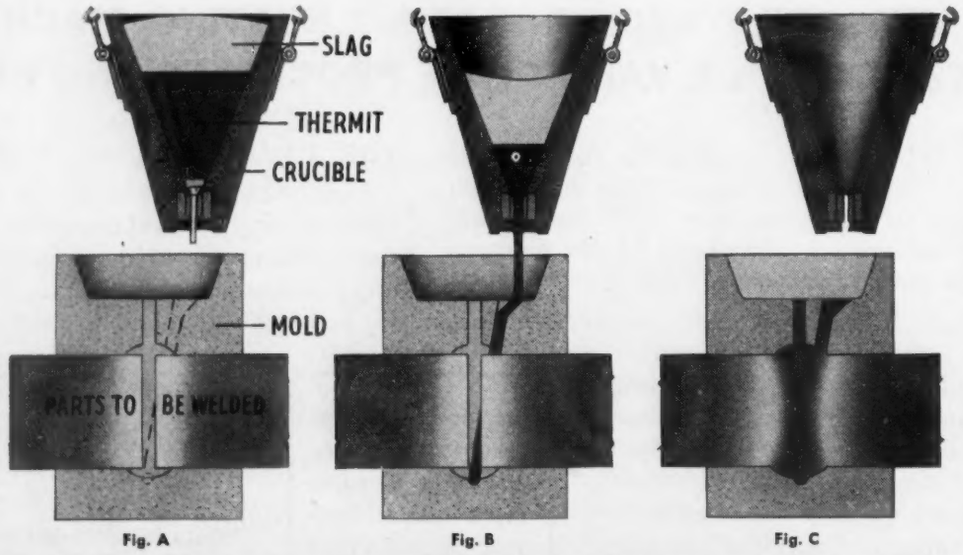
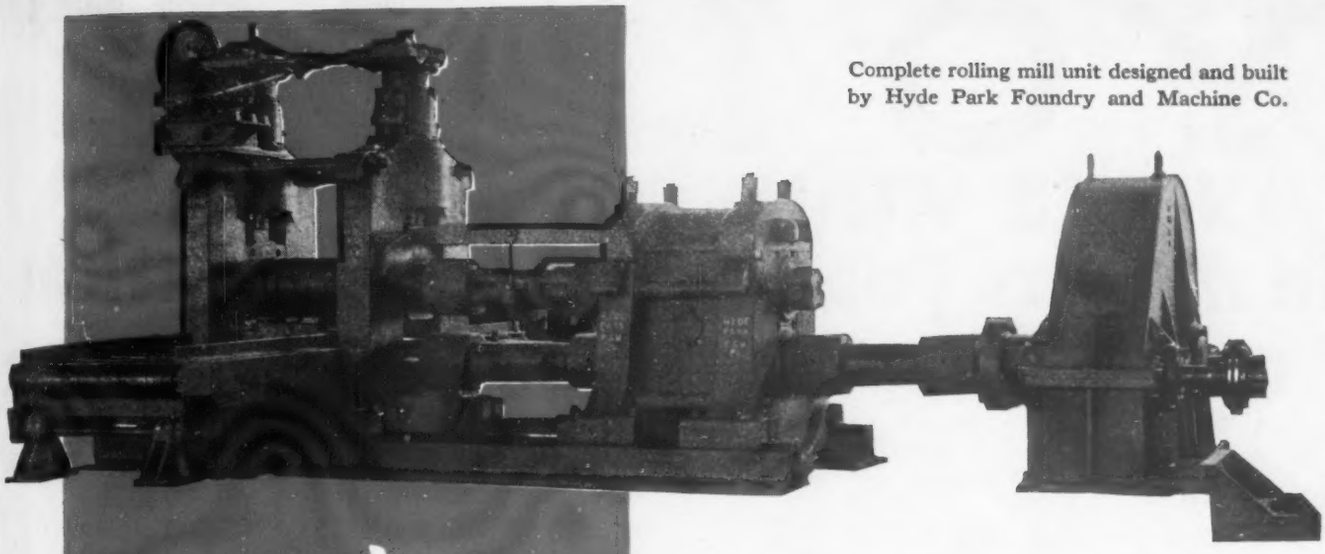


Fig. A Fig. B Fig. C

THERMIT WELDING



Complete rolling mill unit designed and built by Hyde Park Foundry and Machine Co.

Hyde Park...

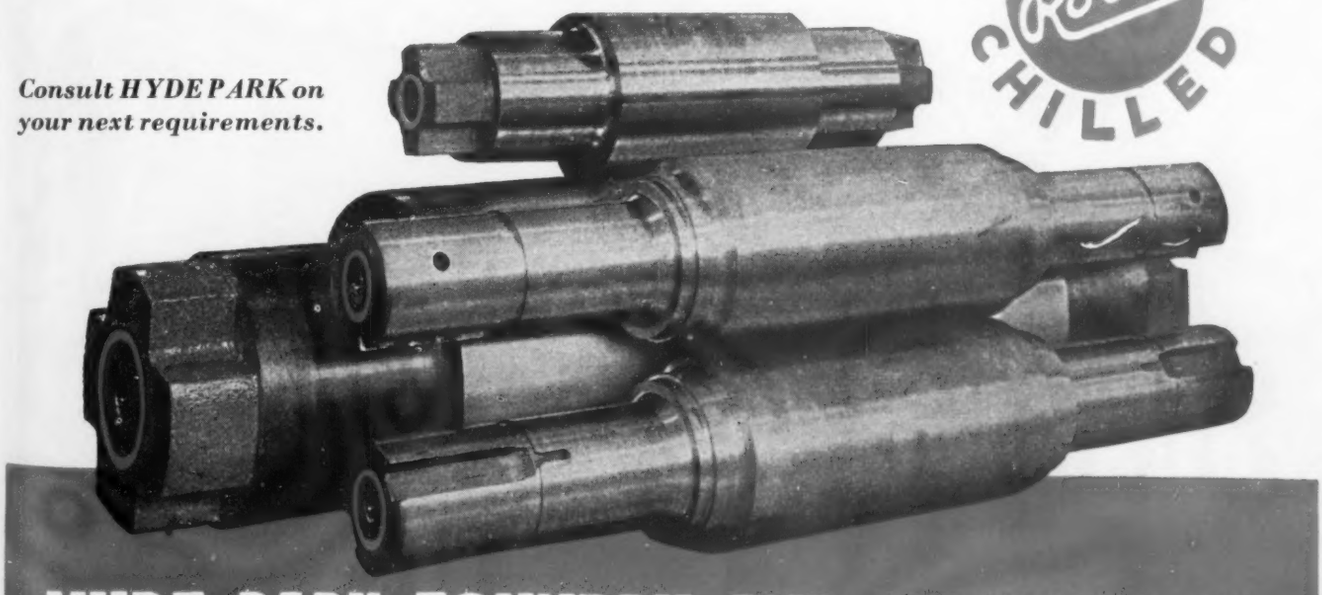
ROLLING MILL MACHINERY and CHILLED ROLLS

HYDE PARK Rolling Mill Machinery includes all kinds of Sheet and Tin Mill Shears, Roll Lathes, Steam Doublers, Sheet Pack Carriers, Stretcher Levellers and Rolling Mill Machinery built to specifications.

HYDE PARK produces the famed "Red Circle" heat treated Alloy and Plain Chilled Rolls for three and four-high Mills, Sheet and Tin Mills, Moly Rolls, Nickel Chilled, Grain Rolls, Cold Rolls and Sand Rolls.

RED CIRCLE Rolls CHILLED

Consult HYDE PARK on your next requirements.



HYDE PARK FOUNDRY AND MACHINE CO.

Hyde Park, Pa. (Pittsburgh District)

YOLOY
IS THE WORD FOR PROGRESS in modern Passenger Car Construction

YOLOY is Youngstown's high-strength nickel-copper low alloy steel. It is available in plates, sheets, strip, bars, shapes, cold drawn bars, seamless and electric weld pipe.

Used for more than ten years in both passenger and freight car construction, Yoloy continues to demonstrate its value for railroad purposes as a weight-saving, long-lived material of construction. Six outstanding characteristics suggest the use of Yoloy for car construction.

1. TENSILE STRENGTH--This property of Yoloy has led to its use for literally scores of applications, to reduce dead weight for increased payload without sacrifice of strength. Car builders report as much as 20% to 25% or more weight saving with Yoloy, as compared to carbon steel.

2. CORROSION RESISTANCE--Repeated tests on a variety of carbon and alloy steels show that the Yoloy type steel stands up unusually well when exposed to the action of marine and industrial atmospheres and other corrosive conditions common to railroad service. In actual service, Yoloy bears out this test-demonstrated ability to resist corrosion.

3. SHOCK RESISTANCE--Standard impact tests as well as performance in service prove that Yoloy retains a marked ability to resist shock, even at the lowest temperatures met in normal service.

4. ABRASION RESISTANCE--Yoloy's toughness enables it to withstand wear and rough treatment through a long lifetime of dependable service.

5. FORMING QUALITIES--Because of its uniformity and its well balanced ductility, high-tensile strength Yoloy works excellently, without weakening or breaking, on angle bends and in involved forming operations.

6. WELDABILITY--Yoloy's unique physical properties, derived from a balanced combination of chemical elements, reduce air hardening to a minimum. Yoloy welds as readily as most carbon steels of the same carbon and manganese content.

Yoloy deserves your careful consideration for modern, streamlined passenger car construction, as well as for any work where weight-saving without loss of structural strength is a prime factor. If you are not familiar with Yoloy steel, let our representative give you the facts.

QUALITY — YOUNGSTOWN — SERVICE

A modern coach, built for one of the western roads. Yoloy construction reduced the dead weight load more than 20%.

YOUNGSTOWN

THE YOUNGSTOWN SHEET AND TUBE COMPANY

GENERAL OFFICES - YOUNGSTOWN 1, OHIO

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Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

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TRUMBULL (T) ELECTRIC

FEEDER DISTRIBUTION SYSTEMS

In exactly the same way that accidents, road blocks and costly maintenance plague the highway department when a road system is inadequate – so do plant managers pay for inadequate electrical power distribution.

Machines cannot efficiently operate at less than their rated voltage—overloaded lines in your plant mean costly patching of your distribution system—MONEY OUT OF YOUR POCKET.

Your inadequate distribution system is no doubt making you pay now for a full-powered, low-cost Trumbull Feeder Distribution System.

Trumbull Busway Systems (main feeders) Flex-A-Power (branch feeders) and Control Centers (motor control distribution) are available to you NOW.

Write directly to Trumbull Electric Mfg. Co., Plainville, Conn., for further information.

Available now FROM FACTORY STOCK

THE TRUMBULL ELECTRIC MANUFACTURING CO. • PLAINVILLE, CONN.

Other Factories at NORWOOD, OHIO • LOS ANGELES • SAN FRANCISCO • SEATTLE

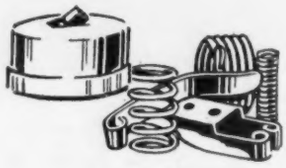
Many potentially good products just do not pay off because they still contain troublesome "bugs"! If this is your case, perhaps we can help by suggesting a change in the material itself. Often a perfectly workable design suffers from the use of a wrong metal or alloy.

It may not spin or form well, and go to the platers with hidden fractures. Corrosion may set in and eventually "freeze" the moving parts. Springs may die of "fatigue" long before their time. Failure of the grain structure to take a good polish may show through the plating. The plating itself may be rough, porous or brittle. Welded joints may not be lasting. Any one of these "bugs" can slow up the sale of the most ingenious product that brains can design.

The Seymour specialties described below have helped many basically sound products back onto very active feet! Our engineers and chemists will gladly do what they can to help you with yours.

SEYMOUR NICKEL SILVER

Because of a wide ductility range and a uniformly even grain, it is a preferred alloy for spinning, drawing, forming. Its silvery white color makes it the ideal base for silver, chromium and nickel plated articles. When it is leaded for free cutting, it has excellent workability.



SEYMOUR PHOSPHOR BRONZE

Its high corrosion resistance solves most salt water and other dampness problems. It has remarkable fatigue resistance. Springs made of it have seemingly endless life! Extremely tough, it is good material for small bearings.

SEYMOUR NICKEL ANODES

Made of virgin nickel in modern electrical furnaces—under accurate pyrometric control and laboratory check all the way. Special grain structure materially reduces sludge and loose nickel. In all standard shapes and formulas, or to special order. Also, copper, brass, bronze and zinc anodes.

SEYMOUR BRIGHT NICKEL

A hot organic type process free from promoter metal, stable, easily controlled. Produces brilliant deposits from a standard hot Watts bath without the usual coloring or buffing. Excellent throwing power. Wide operating conditions. No wetting agents.

SEYMOUR Phosphor Bronze WELDING RODS

For homogeneous welds of high tensile strength. Clean melting, good penetration. Result of nearly seventy years in the manufacture of bronzes and other copper alloys. Grades A, C and D.

THE SEYMOUR MANUFACTURING COMPANY, SEYMOUR, CONNECTICUT

SEYMOUR

NONFERROUS ALLOYS SINCE 1868

Controlled Power by SUTTON

This powerful hydraulic stretching and untwisting machine is but one in a full line of stretchers and untwisters produced by SUTTON, ranging in size from 7½ Tons to 350 Tons. These machines, manufactured by SUTTON ENGINEERING CO. under license from The Aluminum Company of America, are the result of the highest quality engineering skill, research and modern production methods. Any information you may desire concerning them will be sent at your request. There is a SUTTON Machine to suit your every requirement.

SECO

SUTTON ENGINEERING CO.

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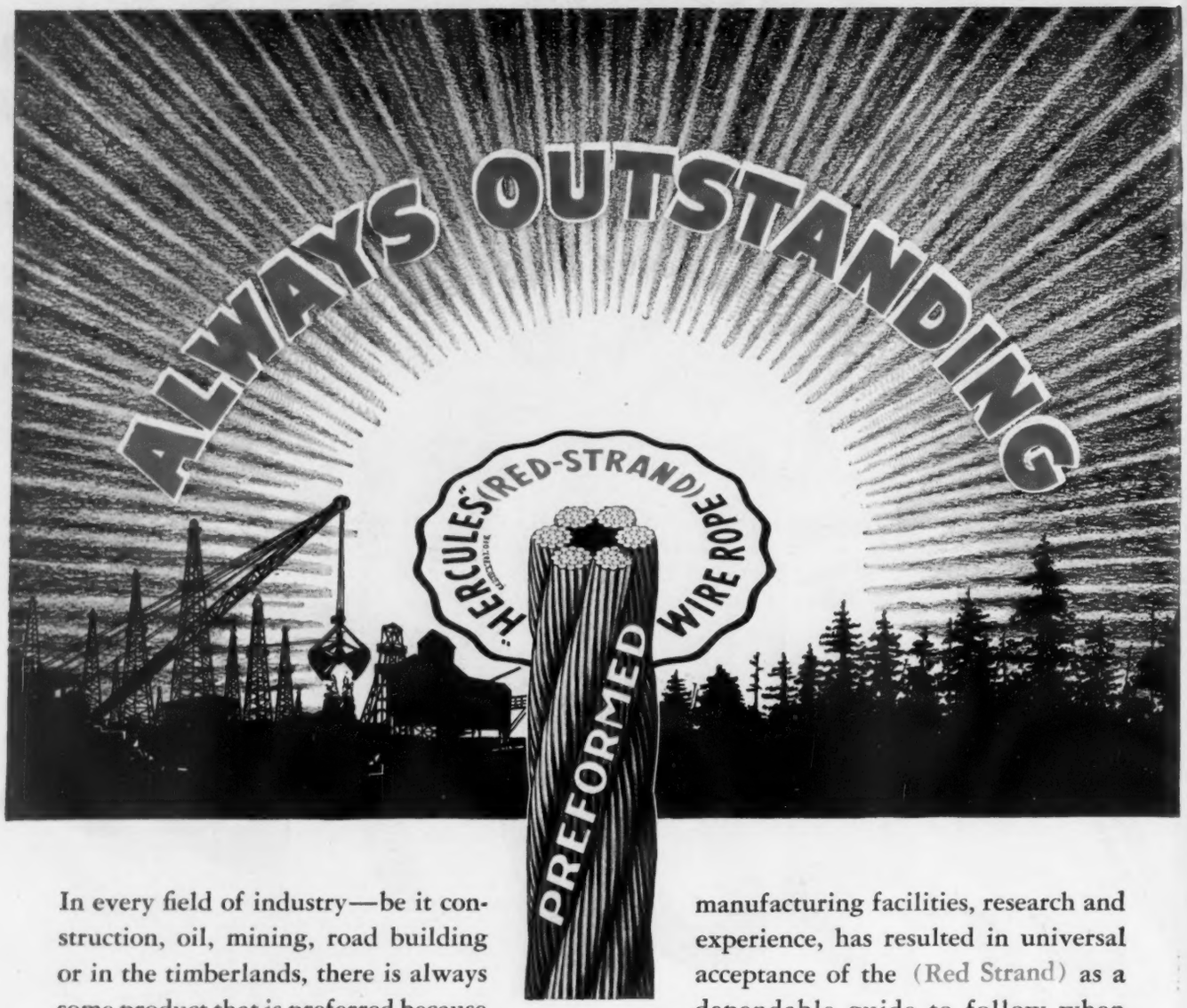

In every field of industry—be it construction, oil, mining, road building or in the timberlands, there is always some product that is preferred because of its dependability . . . and in Wire Rope, "HERCULES" (Red Strand) has continued to enjoy an "outstanding" reputation for over 68 years.

Naturally, there are many reasons for this recognition. First of all, is our own high standards established for the selection and testing of the materials that go into its making.

This unwavering policy, backed by unexcelled manufacturing facilities, research and experience, has resulted in universal acceptance of the (Red Strand) as a dependable guide to follow when buying Wire Rope.

Being made in a wide range of constructions — Round Strand and Flattened Strand . . . Preformed and Non-Preformed . . . there is a style exactly suited to meet *any* heavy duty demand.

Call on our engineering department any time for specific recommendations—they'll welcome your inquiries.

MADE ONLY BY

A. LESCHEN & SONS ROPE CO.

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MANUFACTURERS like to depend on Johnson Bronze for their Sleeve Bearings because of the quality product and our friendly, convenient service. It makes little difference where you are located, you will find a factory trained Johnson Bronze man *as near as your telephone.*

On bearings made to your specifications he is ready, willing and capable to answer your questions regarding the various types and their proper use. For replacement, he places at your disposal complete stocks of automotive and industrial bearings, electric motor bearings, UNIVERSAL Bronze Bars, and Babbitt. Or he will gladly give you the name and address of your local Johnson Distributor.

Isn't this the type of bearing service you can use? Why not plan now to depend on Johnson Bronze? Take full advantage of our more than forty years exclusive bearing experience. Remember, that only Johnson Bronze makes *every* type of Sleeve Bearing.

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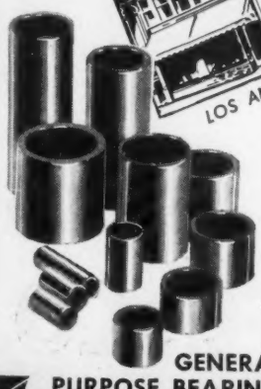
550 S. MILL ST. —— NEW CASTLE, PA.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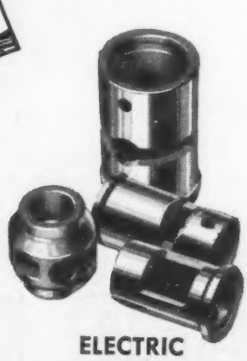
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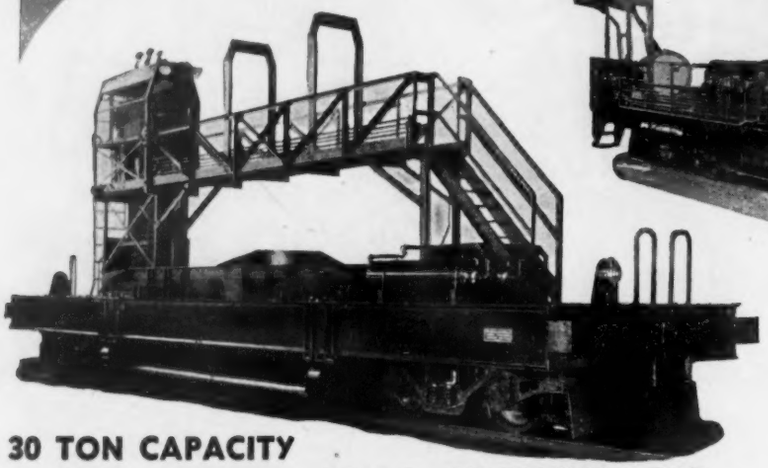
EVERYTHING YOU NEED IN *SLEEVE TYPE BEARINGS*

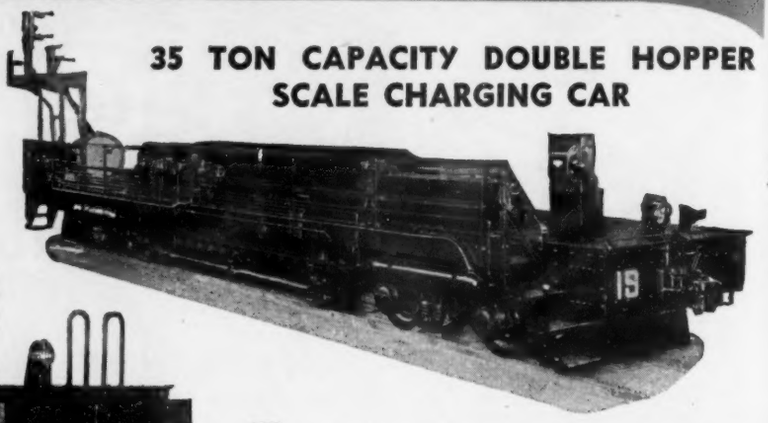
ATLAS Intraplant Haulage Equipment



30 TON CAPACITY DOUBLE HOPPER SCALE CHARGING CAR

This car has underslung self-aligning roller suspension scale with Atlas Indicating and Recording Dial. Equipped with cast steel truck having self-aligning bearings, is provided with air brakes and air operated discharge gates, and all necessary features to insure safety in operation.

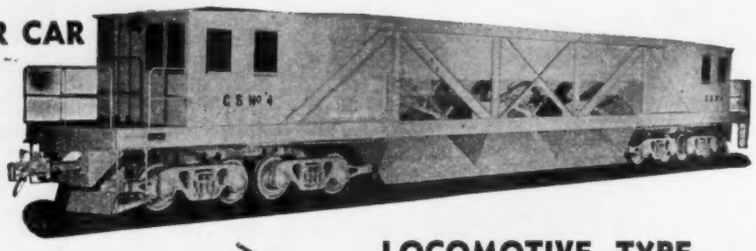
35 TON CAPACITY DOUBLE HOPPER SCALE CHARGING CAR



Scale charging car provided with extra heavy, all steel roller suspension, underslung Atlas scales with renewable knife edges. Self-aligning roller bearings in journals. Equipped with two 75 HP motors with railway type magnetic, plugging control. Car also has complete centralized control lubricating system.

120-TON SIDE DUMP ORE TRANSFER CAR

Used for stocking and reclaiming. Hopper has three compartments each with independently operated discharge gates. Double end control so that operator is always in the front end of the car. Car is powered by four 125 Horsepower Motors with series parallel reversing-plugging type, full magnetic control. Hoppers are provided with electric heaters to prevent freezing of load in severe weather.



Builders of:

DIESEL ELECTRIC AND STORAGE BATTERY LOCOMOTIVES FOR INTERPLANT HAULAGE

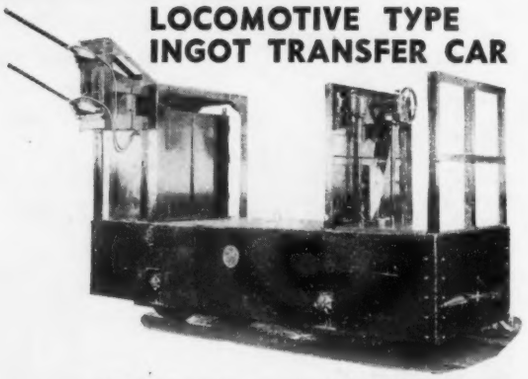
SCALE CHARGING CARS AND ORE TRANSFERS FOR BLAST FURNACE STEEL PLANTS

COAL CHARGING CARS, CLAY CARRIERS DOOR EXTRACTORS, COKE GUIDES AND COKE QUENCHING CARS FOR BY PRODUCT COKE PLANTS

TURNTABLES

INDICATING AND RECORDING DIALS FOR WEIGHING SCALES

LOCOMOTIVE TYPE INGOT TRANSFER CAR



Operator station in elevated position at one end of car with magnetic switch control located opposite end. Car is provided with hydraulic brake system with anti-friction roller bearing—spring mounted journals.

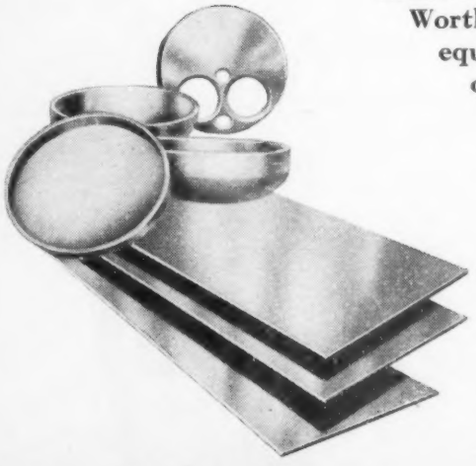
THE ATLAS CAR AND MFG. CO.

CLEVELAND 10, OHIO

Some things *can't* be concealed

There's a thrill in knowing how to tackle a tough job and get the desired results . . . because it takes not only experience and skill . . . but a special sixth sense that makes the task a natural, and endows you with the fine touch of the super-craftsman.

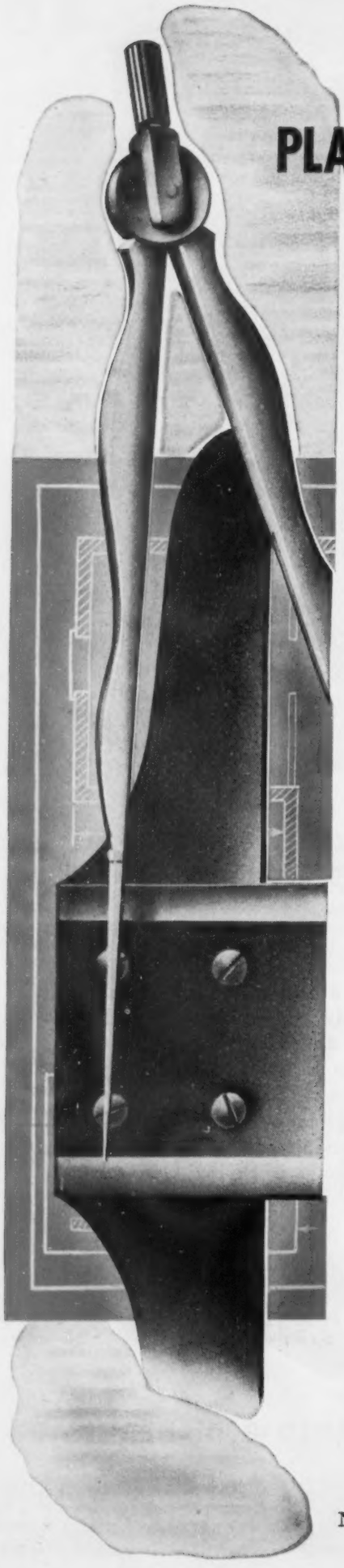
Worth has the innate ability . . . the skill and experience and equipment to turn out plates and heads that are of uniform quality . . . to meet your exacting specifications. Steel Plates up to 150" wide; Flanged and Dished Heads from 9½" to 216" O. D.; in thickness from $\frac{3}{16}$" to 4".



WORTH

STEEL PLATES • FLANGED & DISHED HEADS

WORTH STEEL COMPANY · Claymont, Delaware

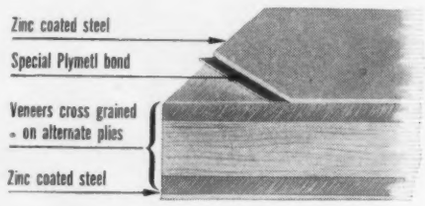


PLAN WITH Plymetl

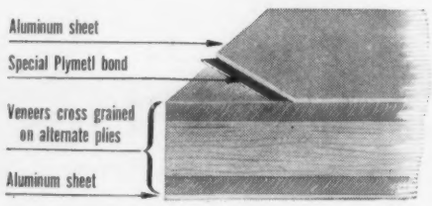
MAKES BETTER PRODUCTS POSSIBLE

Plymetl combines the light weight and rigidity of plywood with the strength of metal. Through 25 years of performance, Plymetl has proved its versatility, durability and dependability. When the War created shortages in supplies of critical metals Plymetl received still greater attention and wider use. Here Plymetl's performance in military equipment proved its worth as a basic structural material. For many applications Plymetl is unsurpassed. Where your product design requires a flat smooth surfaced material of unusual strength and light weight, a material unaffected by moisture and mold and fungi — and rust resistant — SPECIFY PLYMETL. A few of the more widely used types of Plymetl are described and diagramed below.

PLYMETL VE and EVE — A plywood plaque with zinc-coated steel sheet permanently bonded by an exclusive Haskelite method to one (VE) or both faces (EVE). Plymetl panels may be obtained in a range of thicknesses and sizes to suit specific applications. Simple wood-or-metal working tools will fabricate Plymetl.

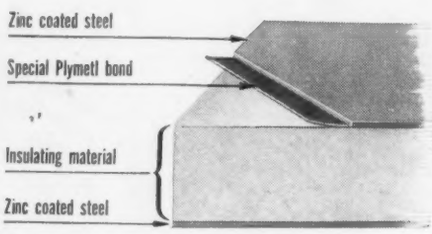


PLYMETL VU and UVU — A plywood plaque with aluminum sheet permanently bonded to one (VU) or both faces (UVU). The great strength and light weight factors of plywood are combined with the light weight of aluminum. Plymetl may be formed to certain curvatures.



PLYMETL ESE — A panel of insulating material with metal sheet permanently bonded to both faces (ESE).

Other types of core materials may be used to make varied kinds of Plymetl. To these cores, metal faces of monel metal, porcelain enamel steel, and stainless steel can be bonded. A core material may be faced with one type of metal on one side and another type on the other side. On all Plymetl panels, the metal faces provide an ideal surface for finishing.



Write for "Plan With Plymetl" . . . this new book describes the various types of Plymetl . . . and data on fabricating, finishing, fastening, etc. Write for your free copy now —

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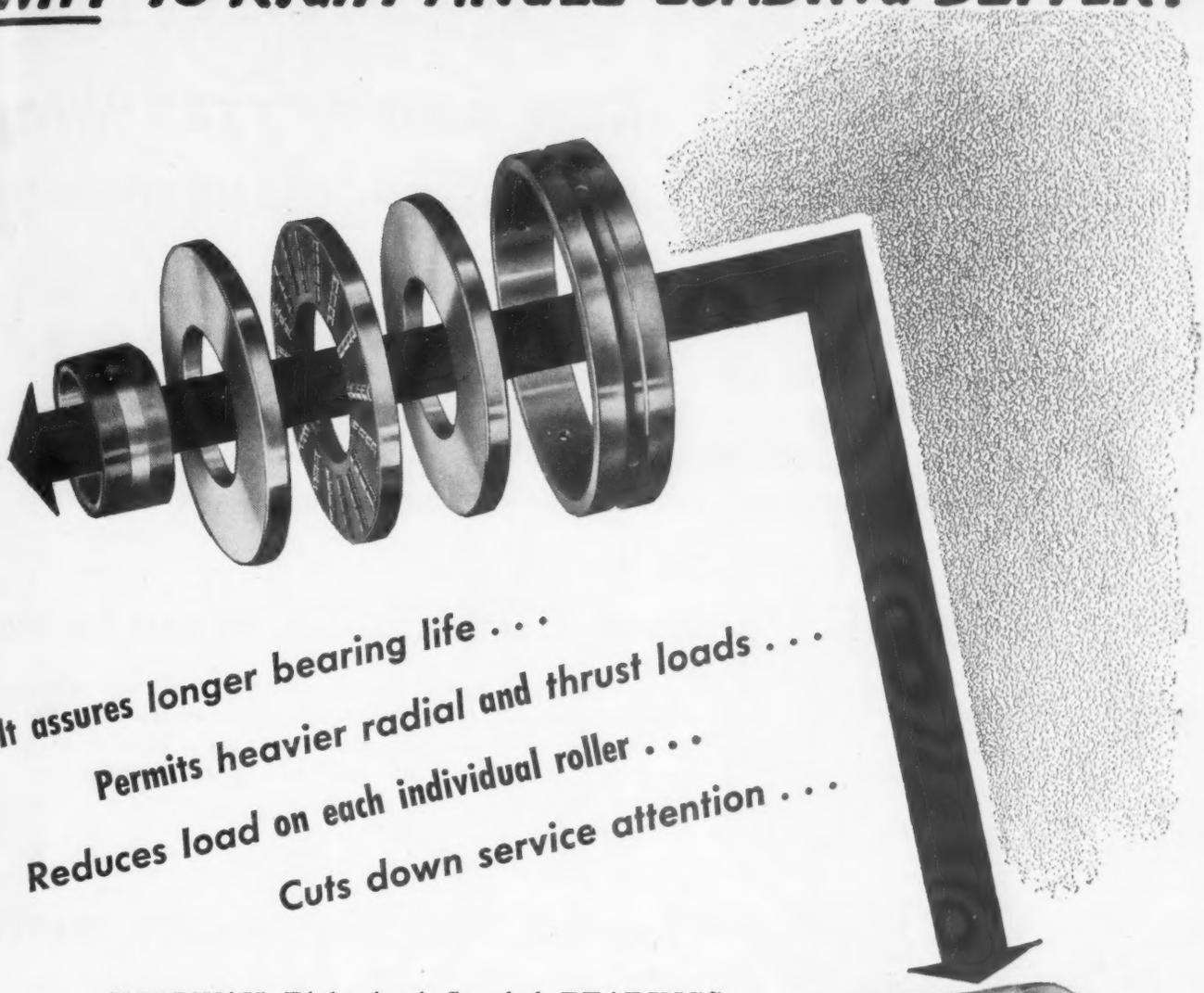
Canada: Railway & Power Engineering Corporation, Ltd.

WHY IS RIGHT-ANGLE LOADING BETTER?



It assures longer bearing life . . .

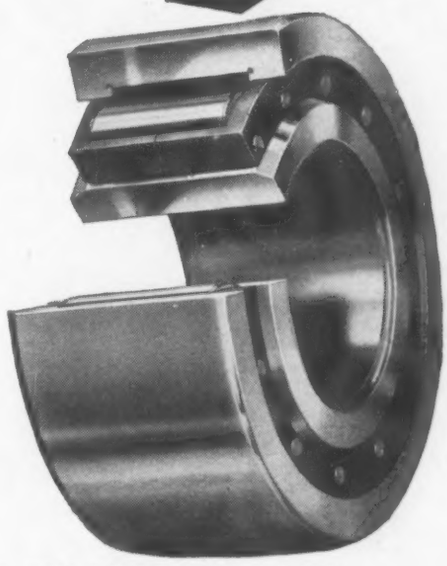
Permits heavier radial and thrust loads . . .

Reduces load on each individual roller . . .

Cuts down service attention . . .

ROLLWAY Right-Angle-Loaded BEARINGS have *every one* of these advantages because they reduce every load to its component parts—*pure radial and pure thrust* . . . and carry *each* of these loads on a *separate* bearing assembly—AT A RIGHT ANGLE TO THE ROLLER.

Because of this, Rollway Bearings can use solid cylindrical rollers of greater mass and cross-section area in a given space. Result: *increased load capacity . . . reduced maintenance attention . . . longer wear, with no pinching or wedging, less friction on roller ends.*



Send us your plans today for engineering analysis and bearing recommendations.

ROLLWAY BEARING CO., INC.
Syracuse, N. Y.

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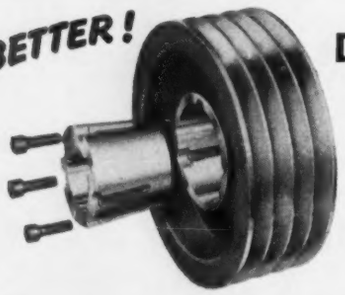
Rollway CYLINDRICAL ROLLER BEARINGS

NEW AND BETTER WAYS OF POWER TRANSMISSION

There are new ways to put more power on the job. Get the facts. Ask the Dodge Transmissioneer to tell you about the latest developments by Dodge of Mishawaka. The Transmissioneer is your local Dodge distributor, listed in the classified telephone directory under "Power Transmission Equipment."

DODGE MANUFACTURING CORPORATION, MISHAWAKA, INDIANA

NEW AND BETTER!



DODGE TAPER-LOCK BRAND SHEAVE

An entirely new type of taper bushed sheave—the simplest, surest mechanism ever devised for holding wheels to shafts! No flange. No collar. No protruding parts. Mounts as a complete unit. Breaks all speed records in mounting and demounting—saves time and temper.

NEW AND BETTER!

DODGE ROLLING GRIP FRICTION CLUTCH

No Toggles! Rugged, compact, easy to adjust. Another great achievement of Dodge Transmissioneering . . . designed to give outstanding flexibility and ease of control without any sacrifice of positive drive . . . and available at low cost! Sizes ½ H. P. to 20 H. P. at 100 R.P.M.

NEW AND BETTER!

DODGE *BronZoil* BEARING

Designed especially for exacting requirements of fan and blower service. Capillary bronze bushing has capacity of one-third its volume in oil. Reservoir and wick provide ample lubrication. Fully self-aligning. Neoprene oil resisting grommets available for noise isolation.

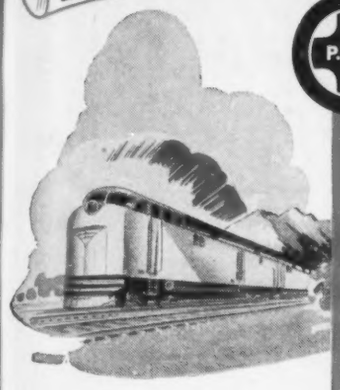
DODGE
MISHAWAKA

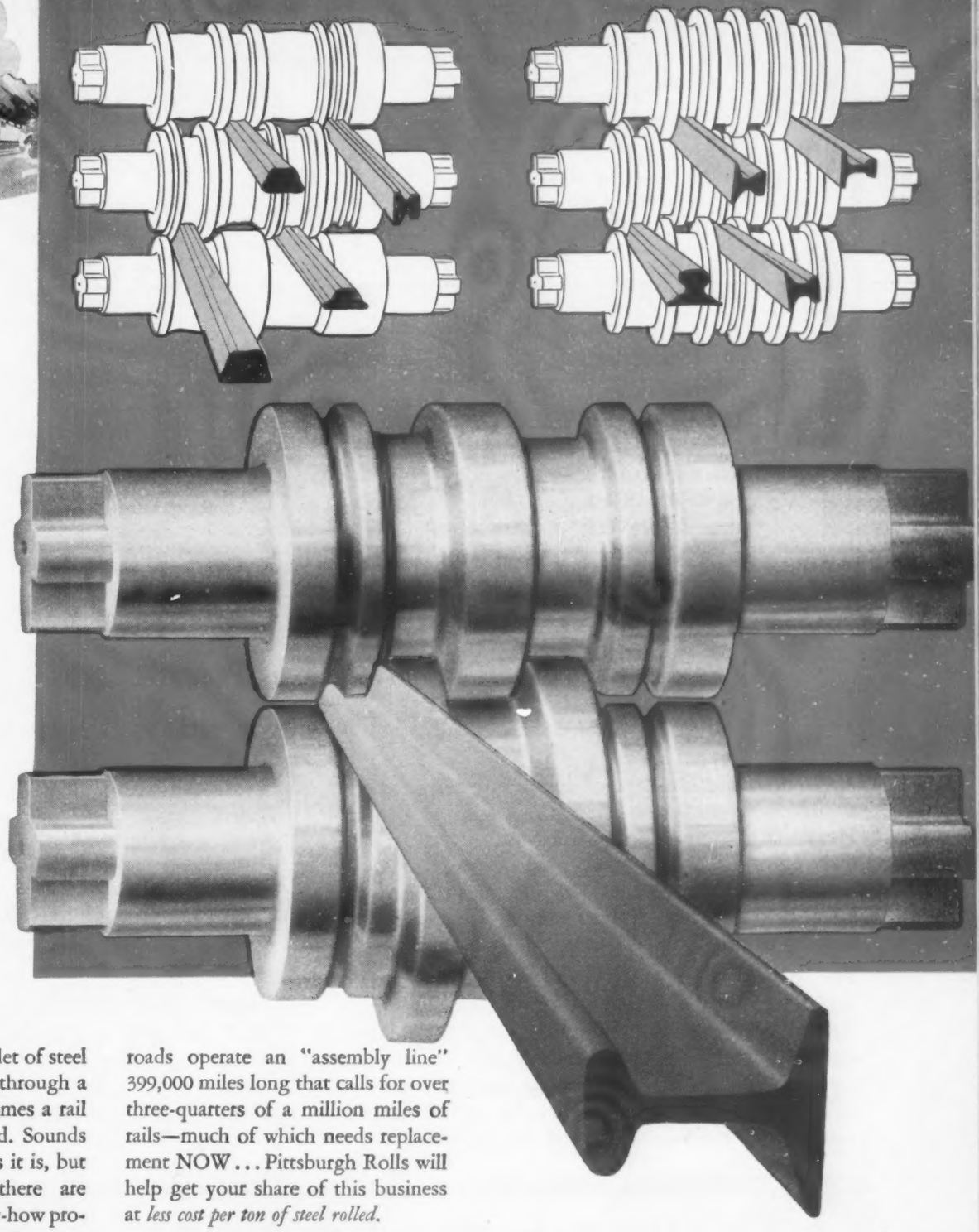
Copyright, 1946, Dodge Mfg. Corp.

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

ROLLING TECHNIQUE ... RAILS



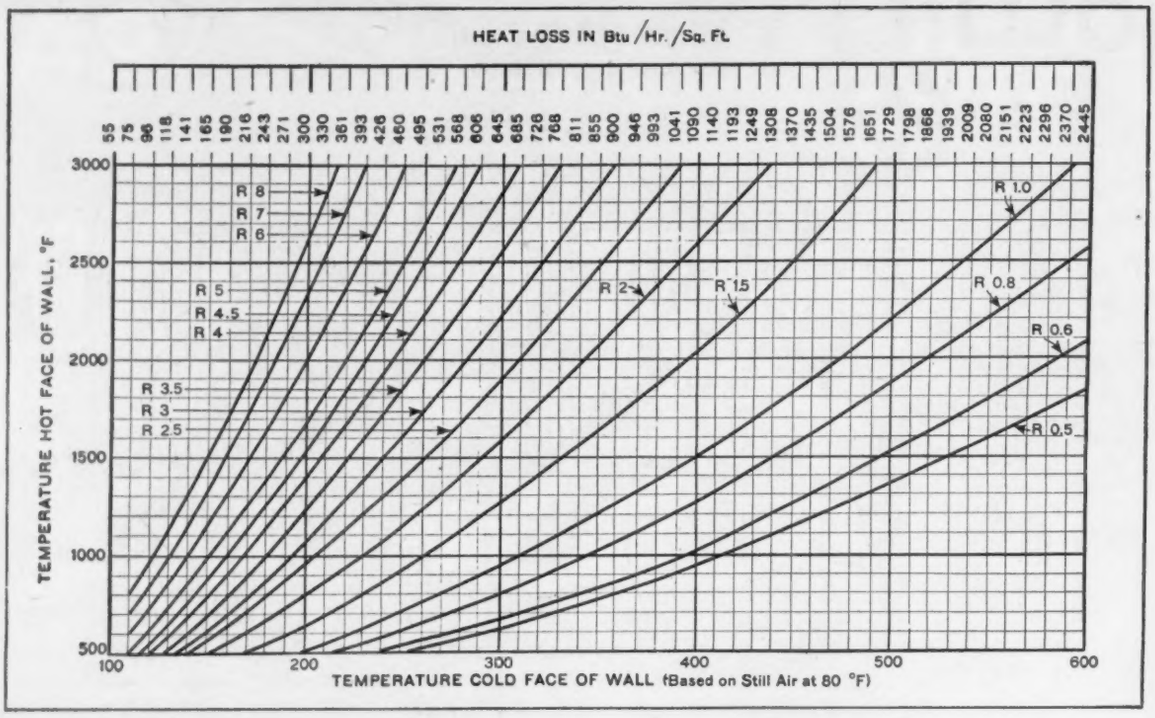


You just take a red-hot billet of steel and pass it 8 or 10 times through a Pittsburgh roll and out comes a rail ready for duty on the road. Sounds simple, doesn't it? Perhaps it is, but behind that simplicity there are several generations of know-how provided by roll-makers and the men who operate them.

Today America's vast systems of railroads operate an "assembly line" 399,000 miles long that calls for over three-quarters of a million miles of rails—much of which needs replacement NOW... Pittsburgh Rolls will help get your share of this business at *less cost per ton of steel rolled.*

PITTSBURGH ROLLS
Division of Blaw-Knox Co.
PITTSBURGH, PA.

PITTSBURGH ROLLS



For a one component wall $R = \frac{L}{K}$ where L = thickness of wall in inches

K = Conductivity (Btu/sq. ft./degree F difference in temperature/in. thick)

For a wall of n components $R = \frac{L1}{K1} + \frac{L2}{K2} + \cdots\cdots + \frac{Ln}{Kn}$

where L_1, L_2, etc. = thickness of each component

K_1, K_2, etc. = conductivity of each component

Temperature at First Joint from Hot Face = Hot Face Temperature — (Btu loss x $\frac{L1}{K1}$)

" " Second Joint from Hot Face = First Joint Temperature — (Btu loss x $\frac{L2}{K2}$)

For Efficient Industrial Furnaces Check Wall Design with This Chart

Engineers and builders of industrial furnaces can easily check heat-flow calculations with this chart. Heat loss and outside wall temperature can be read directly when inside temperature, wall thickness and conductivity of refractory are known. And the insulating effect of different wall sections can be quickly compared.

For adaptability to service requirements, Refractory Concrete—made with LUMNITE and a refractory aggregate—has unique advantages. Conductivity and refractory limit depend on the mix and the type of aggregate. For example, certain light-weight aggregates yield Refractory *Insulating* Concrete with conductivity one-third that of Refractory Concrete made with LUMNITE and crushed firebrick.

Refractory Concrete is cast in place to fit the job. The wall or arch can be just the right thickness for efficient operation of the furnace. A 6-inch or 15-inch wall can be built as easily as one which is 9 inches or 13½ inches thick.

A Booklet, "Heat Transmission Through Furnace Walls," contains ten similar time-saving charts. For your free copy, write: LUMNITE DIVISION, Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

LUMNITE FOR REFRACTORY CONCRETE

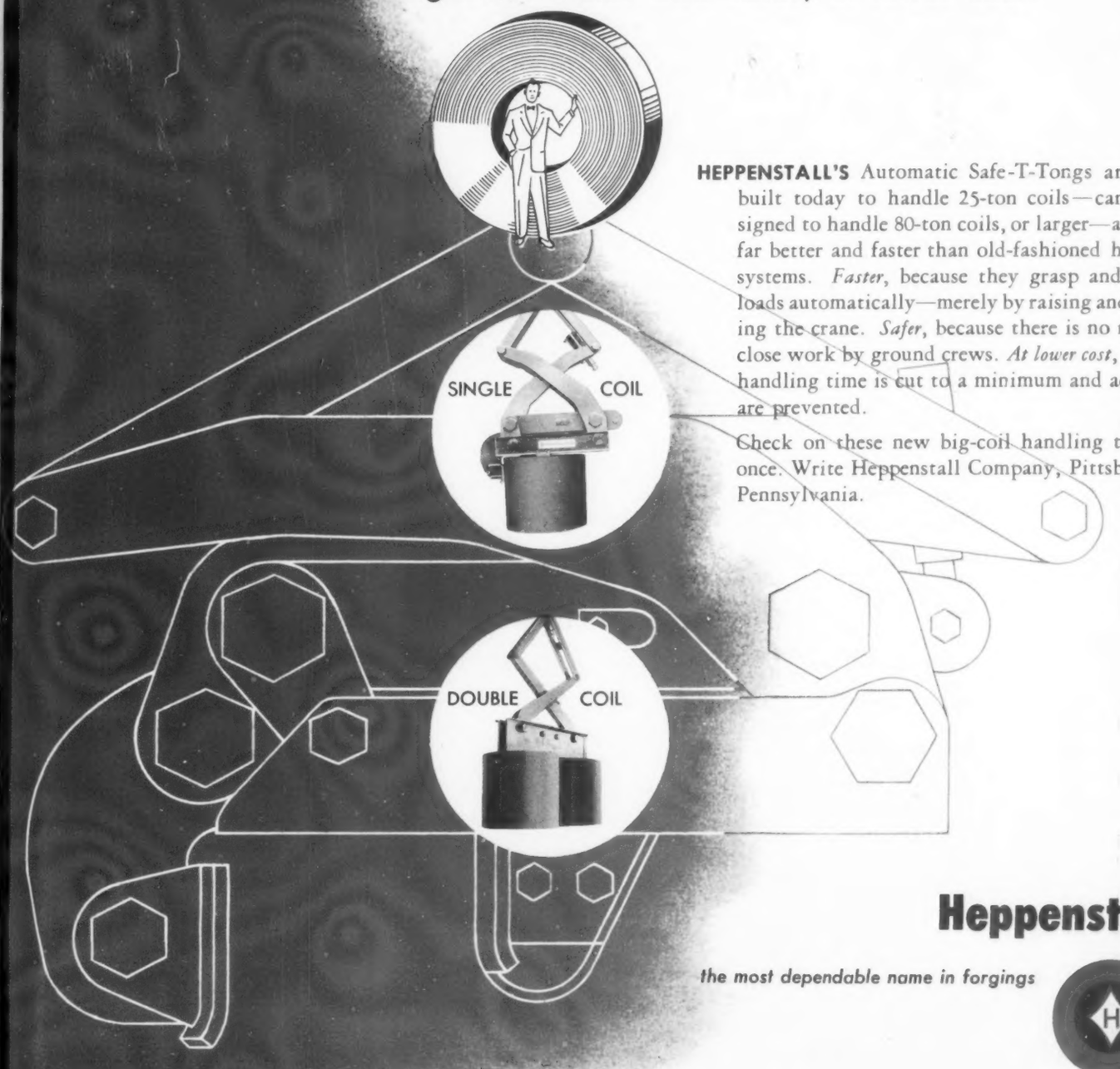
"THE THEATRE GUILD ON THE AIR"—*Sponsored by U. S. Steel—Sunday Evenings—ABC Network*

Are you joining the swing to

Larger coils?

HEPPENSTALL AUTOMATIC SAFE-T-TONGS

will swing them faster and safer, *at lower cost!*



HEPPENSTALL'S Automatic Safe-T-Tongs are being built today to handle 25-ton coils—can be designed to handle 80-ton coils, or larger—and do it far better and faster than old-fashioned handling systems. *Faster*, because they grasp and release loads automatically—merely by raising and lowering the crane. *Safer*, because there is no need for close work by ground crews. *At lower cost*, because handling time is cut to a minimum and accidents are prevented.

Check on these new big-coil handling tongs at once. Write Heppenstall Company, Pittsburgh 1, Pennsylvania.

Heppenstall

the most dependable name in forgings

Announcing –

McLouth Stainless Steel

Our entirely new and separate division is now producing McLouth Stainless Steel.

Our Stainless Steel products include a wide range of types and gauges of stainless sheet and strip steel for the rapidly increasing demands of the automotive, refrigeration, chemical, home appliance, dairy food equipment and other industries.

Our facilities for the production of hot and cold rolled carbon sheet and strip steel have also been enlarged to serve the increasing requirements of our customers for these products.

McLOUTH STEEL CORPORATION

DETROIT 17

PLYMOUTH LOCOMOTIVES SERVE The SHIPYARDS

This Plymouth Locomotive, a veteran of several years service, continues to provide dependable, economical intraplant haulage at the Alabama Dry Dock and Shipbuilding Company plant in Mobile, Alabama.

Used primarily to haul carloads of heavy materials from storage tracks to the plant, this locomotive also handles shorter, but equally important, hauls between the machine shop and vessels on the ways.

On time, low-cost intraplant transportation is characteristic of Plymouth Locomotives. Standard and narrow gauge models, gasoline, diesel mechanical and diesel electric powered . . . there's a Plymouth Locomotive to meet your requirements. Details are available. . . . Write Plymouth Locomotive Works, Dept. A-1, Plymouth, Ohio.

TRACK HAULAGE IS CHEAPER HAULAGE

PLYMOUTH LOCOMOTIVES

GASOLINE, DIESEL MECHANICAL AND DIESEL ELECTRIC

PLYMOUTH LOCOMOTIVE WORKS • Division of The Fate-Root-Heath Co., Plymouth, Ohio, U.S.A.

CONFIDENCE.

Manufacturers of Wire Rope and Strand • Fittings • Slings • Screen, Hardware and Industrial Wire Cloth • Aerial Wire Rope Systems
Hard, Annealed or Tempered High and Low Carbon Fine and Specialty Wire, Flat Wire, Cold Rolled Strip and Cold Rolled Spring Steel • Ski Lifts

. . . . . how much is it worth?

IN 1841, two years before the first telegraph line was installed in this country, and when there were but 27 states in the Union, John August Roebling was inspired with the idea of making a new kind of rope of unheard of strength and flexibility. His confidence in his idea caused him to risk everything he had on the development of his new rope.

How much is his confidence worth to Industry today, which couldn't turn a wheel without the modern wire rope?

Today, the John A. Roebling's Sons Company invests much time, effort and money in the development of improved products to keep alive the confidence of its many customers.

Roebling values this confidence as its greatest asset. That's why it offers you the greatest value for every dollar you invest . . . in *any* Roebling product.

HOW TO SAVE WIRE ROPE DOLLARS

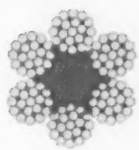
Wire rope is a machine of many parts and, like any machine, even the finest of wire ropes can be destroyed quickly through faulty installation or improper maintenance. To insure against this possibility, Roebling established its Field Engineering Service.

Every Roebling Field Engineer has a thorough knowledge of wire rope . . . its types, its uses, its features and limitations. This knowledge plus the experience he gains in his daily contacts can be a great asset to you . . . helping you solve those tough wire rope problems . . . giving you more service for each wire rope dollar.

Get to know your Roebling Field Engineer. Call him at your nearby Roebling Branch Office.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

FOR EXAMPLE—"BLUE CENTER" STEEL WIRE ROPE



Roebling entrusts your confidence in Roebling and Roebling products to the performance of its "Blue Center" Steel Wire Rope. It is the best rope Roebling knows how to make. It is available as preformed or non-preformed, in a complete range of sizes and constructions to meet a great variety of operating conditions. Its uses are almost unlimited and its performance is consistently economical.

Systems
Ski Lifts

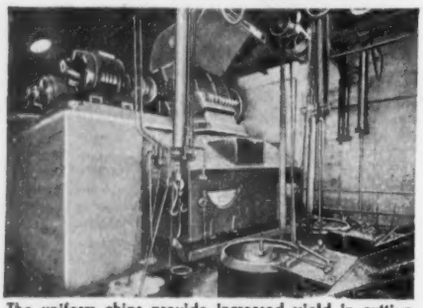
Electrical Wire and Cable • Suspension Bridges and Cables
Aircord, Aircord Terminals and Air Controls • Lawn Mowers

ROEBLING

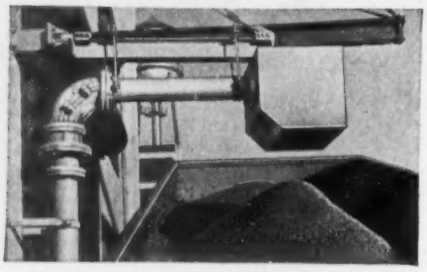
A CENTURY OF CONFIDENCE

DO YOUR METAL TURNINGS GIVE A PROBLEM OR A PROFIT?

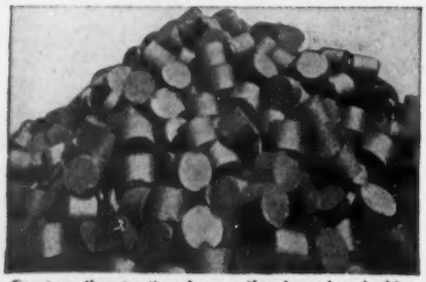
Turnings are fed to the American Metal Turnings Crusher at a rapid rate without danger of constant clogging.



The uniform chips provide increased yield in cutting oil reclamation of from 30 to 50 gallons per ton.

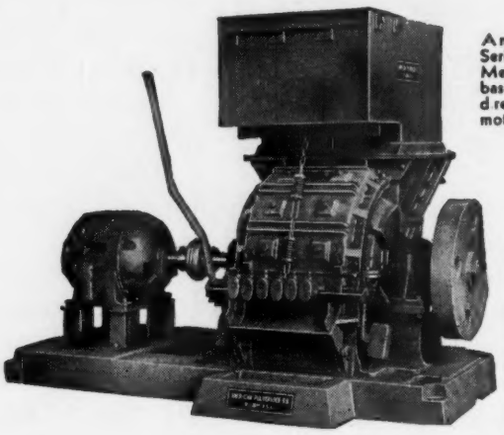


Properly reduced chips enable economical handling in blower, conveyor or manual operations.



Greater oil extraction from uniformly reduced chips permits higher analyses briquetting for furnace charging with reduced scrap loss.

Bulky turnings are profitably converted to compact, labor-and-space-saving chips with increased cutting oil yield and higher analysis briquetting with the American Rolling Ring Turnings Crusher



American "2400" Series Rolling Ring Metal Turnings Crusher base mounted and direct-connected to motor.

Patented manganese shredder rings, revolving free on individual shafts, prevent clogging and damage from tramp iron.

The rapid reduction of long curly, bulky turnings into short shoveling chips with Americans ends your storage and handling problem and the efficiency of Americans makes the operation a profitable one.

Alloy steel, carbon steel, aluminum, brass, copper and bronze turnings from automatic lathes and screw machines are reduced to uniform chips by Americans in capacities from 1 to 10 tons per hour.

THE AMERICAN "METAL TURNINGS" BULLETIN GIVES COMPLETE, DETAILED INFORMATION—SEND FOR IT!

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1539 Macklind Avenue
St. Louis 10, Mo.

THERE IS A KLOSTER "PURE-ORE" FINE TOOL STEEL FOR EVERY TOOL AND DIE PURPOSE

"PURE-ORE"

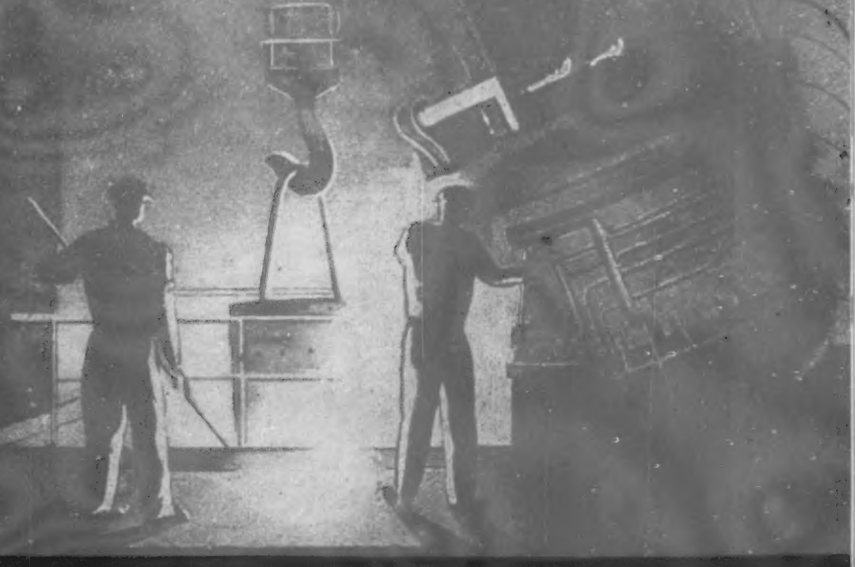
FINE TOOL STEELS

REG. U. S. PAT. OFF.

All "PURE-ORE" Steels are 100% Magnaflux Inspected at our warehouse.

HUNDREDS OF TONS IN CHICAGO STOCK

"Swed-Oil" Non-Shrinking Steel
"Hi-Run" Hi-Chrome Hi-Carbon Steel
"Pure-Ore" Super Alloy Steel
"Chix-Alloy" Chisel Steel
"Pure-Ore" D-C-33 Hot Work Steel
"Pure-Ore" Carbon Tool Steels
"Pure-Ore" Drill Rod
ALSO SPECIAL ALLOY STEELS



SEND FOR DESCRIPTIVE LITERATURE

KLOSTER STEEL CORPORATION

224-228 N. JUSTINE ST. - CHICAGO 7, ILL. - PHONE HAYMARKET 3450

"Steel to Endure Must be Pure"

Preventing Trouble

IS FAR CHEAPER THAN ATTEMPTING TO CURE IT LATER

The first requirement for the successful operation of mechanical assemblies which incorporate rotating or reciprocating shafts is an adequate uncontaminated lubricant supply.

Keeping that supply confined within the mechanism and excluding destructive abrasive and corrosive matter is precisely what "Perfect" Oil Seals accomplish consistently. Before that design of yours goes too far talk to a Chicago Rawhide engineer. He may be able to save you both time and effort.

CHICAGO RAWHIDE MANUFACTURING COMPANY

1308 ELSTON AVE. • CHICAGO 22, ILLINOIS

PHILADELPHIA • CLEVELAND • NEW YORK • DETROIT • BOSTON • PITTSBURGH • CINCINNATI

67 YEARS MANUFACTURING QUALITY MECHANICAL LEATHER GOODS EXCLUSIVELY AND NOW SIRVENE SYNTHETIC PRODUCTS

Los Angeles Times 9 A.M. FINAL

1280-Mile Gas Line Authorized

Project Will Cost $70,000,000 to Bring Texas Fuel Here

A 1280-mile, $70,000,000 pipe line to bring natural gas here from Texas and New Mexico has been authorized by the Federal Power Commission, officials of two gas companies in Los Angeles were informed yesterday.

The pipe-line facilities are designed to meet a developing shortage in the local natural gas supply for 3,500,000 persons in California [illegible] F.P.C.

Berkeley Continuous

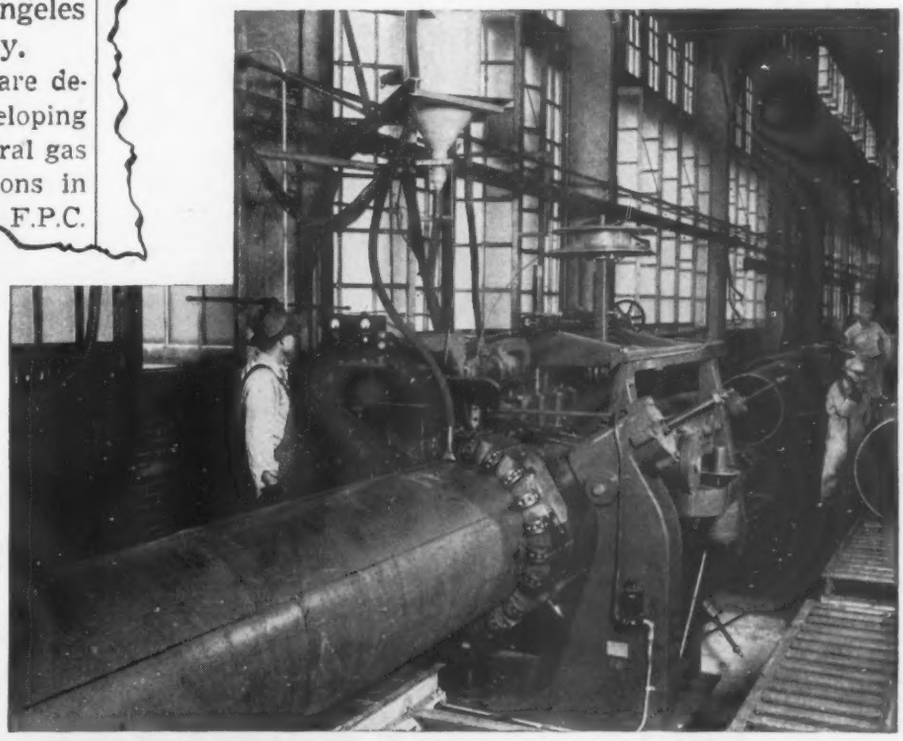
Longitudinal Seam Welders

will weld the seams of the largest diameter pipe-line ever authorized

It's a big job to weld the seams of 30" fabricated pipe. It must be done economically and the machines for doing it must be dependable—that's why the Consolidated Steel Corp. selected the 3C Berkeley for this important work. They know it will deliver uniform, high quality welds continuously day after day.

There's a size "Berkeley" to weld preformed tubes 5" to 36" in diameter.

Write us, we will suggest the best type for your requirements.



Illustrated is a Type 3C "Berkeley" in operation. Machines like this will be used for welding the pipe for this big undertaking.

PENN TOOL & MACHINE CO.
DANVILLE, ILLINOIS

A few notes...

on how Ohio Ferro Alloys help the Iron and Steel Industry

Memo

FERRO-SILICON

50% - 75% - 85% - 95%

Clean... uniform products for consistent results

Memo

SPECIAL BLOCKING 50% FERRO-SILICON

for efficient and economical blocking practice

Memo

H. C. FERRO-CHROME

Top Quality in every respect

Memo

SIMANAL

to improve aluminum additions... better distribution of inclusions

Memo

Careful consideration of your requirements... prompt service

•

Practical metallurgical assistance

FERRO-SILICON 50% - 75% - 85% - 95%

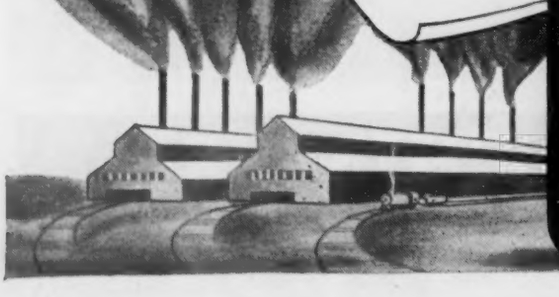
SPECIAL BLOCKING 50% FERRO-SILICON

H. C. FERRO-CHROME • FERRO-MANGANESE

BOROSIL • SIMANAL

Briquets

SILICON • MANGANESE • CHROME



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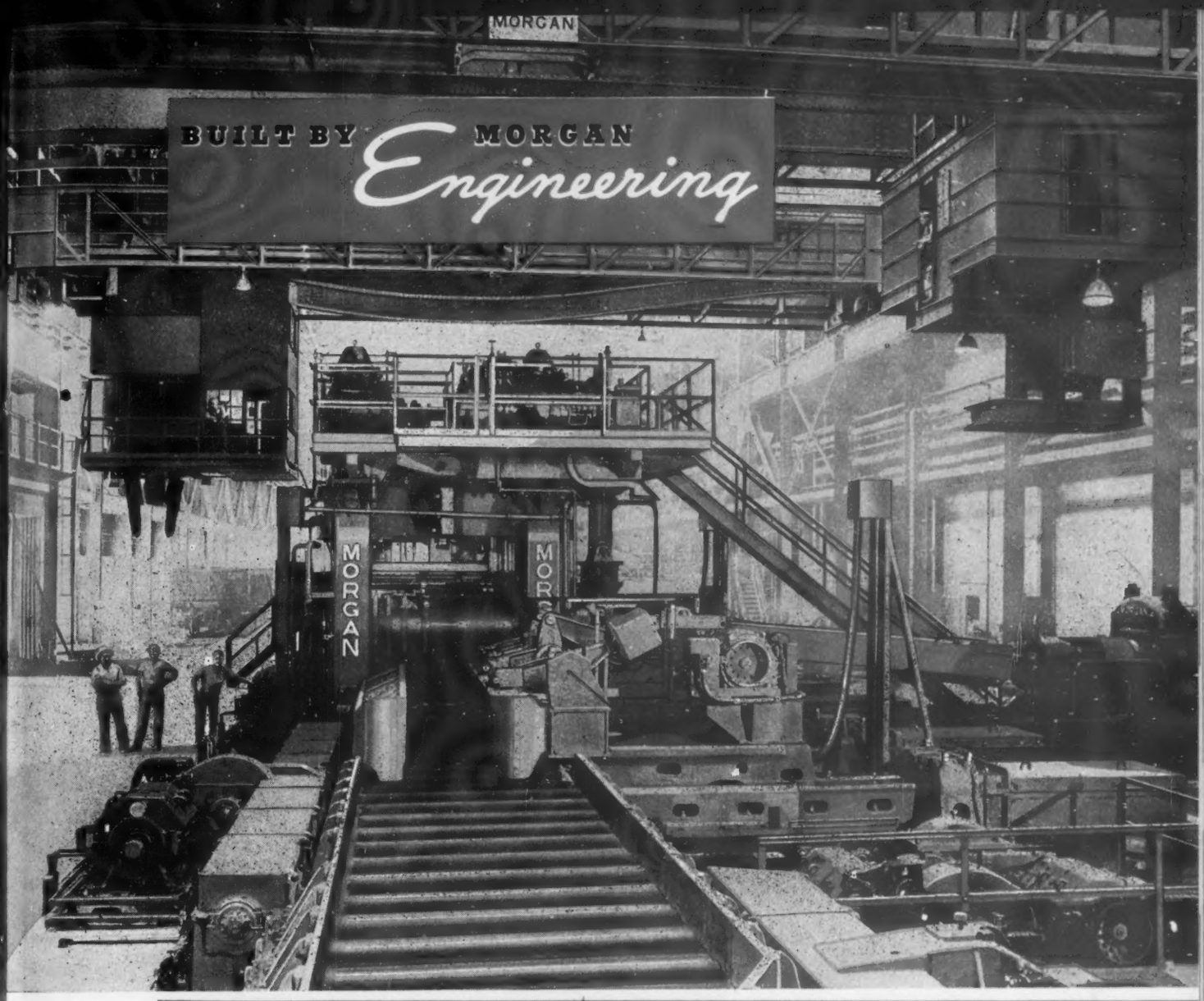
PHILO BRAND — DEPENDABILITY • QUALITY • SERVICE

RAINIER BRAND — DEPENDABILITY • QUALITY • SERVICE

Ohio Ferro-Alloys Corporation

Canton, Ohio

Chicago Detroit Pittsburgh San Francisco Tacoma



MORGAN "36" TWO-HIGH BLOOMING MILL

GROUPED OVER THE MILL IS A MORGAN 7½-TON SOAKING PIT CRANE AND A MORGAN 200-TON 81'-3" SPAN UNIVERSAL TYPE INGOT STRIPPE

With this Mill was furnished Auxiliary Equipment as follows — Front and Rear Tables with Manipulator — Approach Table — Ingot Buggy — Runout Tables — Slab Shear with Gauge — Crop Hoist — Pushers — Conveyor — Skid Bed and Furnace Tables.

Above is shown a Morgan 36" two-high blooming mill complete with double manipulator, front and rear tables. Three mills of this type were recently furnished prominent mid-west steel producers. Housings are one-piece steel castings of the closed top type. Top roll balance is of the counterweight type.

Manipulator is of the overhead type, compact and accessible. Tables are of heavy design, equipped with anti-friction bearings. Screw-down drive is arranged to provide crane hook access when changing guides. Provision is made for automatic lubrication and exclusion of scale and dirt.

THE MORGAN ENGINEERING CO.

ALLIANCE, OHIO. 1420 Oliver Building, Pittsburgh

DESIGNERS • MANUFACTURERS • CONTRACTORS • BLOOMING MILLS • PLATE MILLS • STRUCTURAL MILLS • ELECTRIC TRAVELING CRANES • CHARGING MACHINES • INGOT STRIPPING MACHINES • SOAKING PIT CRANES • ELECTRIC WELDED FABRICATION • LADLE CRANES • STEAM HAMMERS • STEAM HYDRAULIC FORGING PRESSES • SPECIAL MACHINERY FOR STEEL MILLS

SPECIALIZING
IN FORGING OF
HUBS...GEAR BLANKS...FLYWHEELS

The Jackson Drop Forge Company offer facilities to fulfill your requirements including complete die facilities for all types of round work.

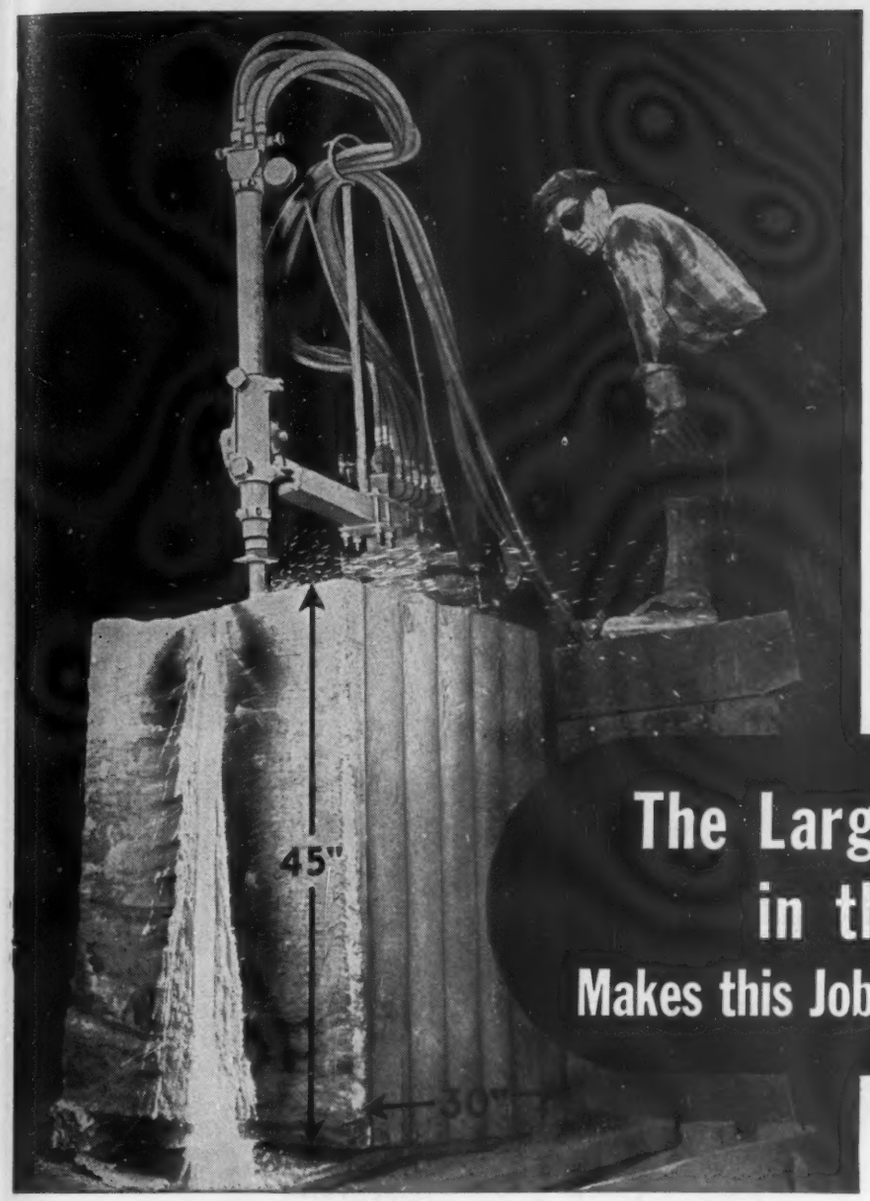
Our forging equipment consists of three thousand and four thousand pound Erie steam hammers, shears for cutting steels up to seven inches round, overhead cranes and complete finishing equipment.

Our power house boiler uses oil and is not hindered by present or future, lack of coal. A railroad siding runs into our plant from the main line of the New York Central Railroad.

Your inquiries will receive prompt attention.

JACKSON DROP FORGE Company

2001 WELLWORTH AVENUE • JACKSON, MICHIGAN



The Largest Blowpipe in the World Makes this Job as Easy as it Looks

It takes just **15 minutes** to slice through an ingot of this size. For eight hours a day, five days a week, this giant OXWELD C-45 oxy-acetylene blowpipe and another just like it are in operation at this mill slitting ingots for scrap.

IF YOU CAN USE A RAPID METAL-CUTTING METHOD...

If a fast, economical method for cutting heavy ingots, risers, or forgings, will increase efficiency of operations in your plant, get in touch with the nearest Linde representative. He will help you to determine if your job can be done better by methods developed by The Linde Air Products Company.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 E. 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities

In Canada: Dominion Oxygen Company, Limited, Toronto

LINDE OXYGEN

PREST-O-LITE ACETYLENE

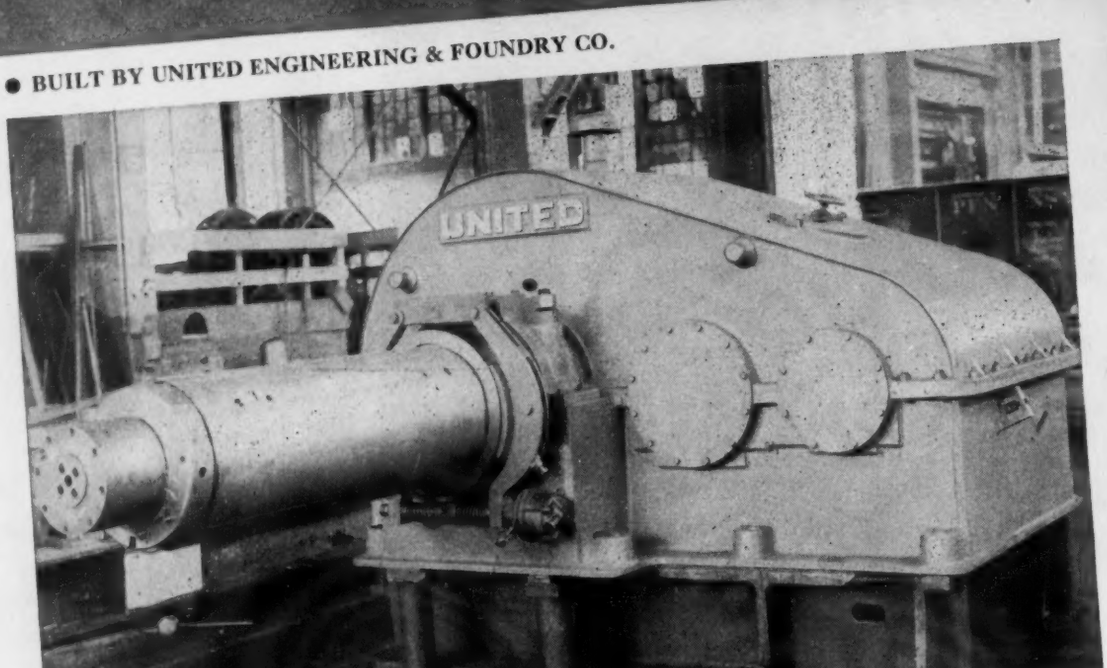
UNION CARBIDE

OXWELD, PUROX, PREST-O-WELD, UNIONMELT APPARATUS

OXWELD AND UNIONMELT SUPPLIES

The words "Linde," "Oxweld," "Prest-O-Lite," "Prest-O-Weld," "Purox," "Union," and "Unionmelt" are trade-marks of Union Carbide and Carbon Corporation or its Units.

● BUILT BY UNITED ENGINEERING & FOUNDRY CO.



Built-in Alignment

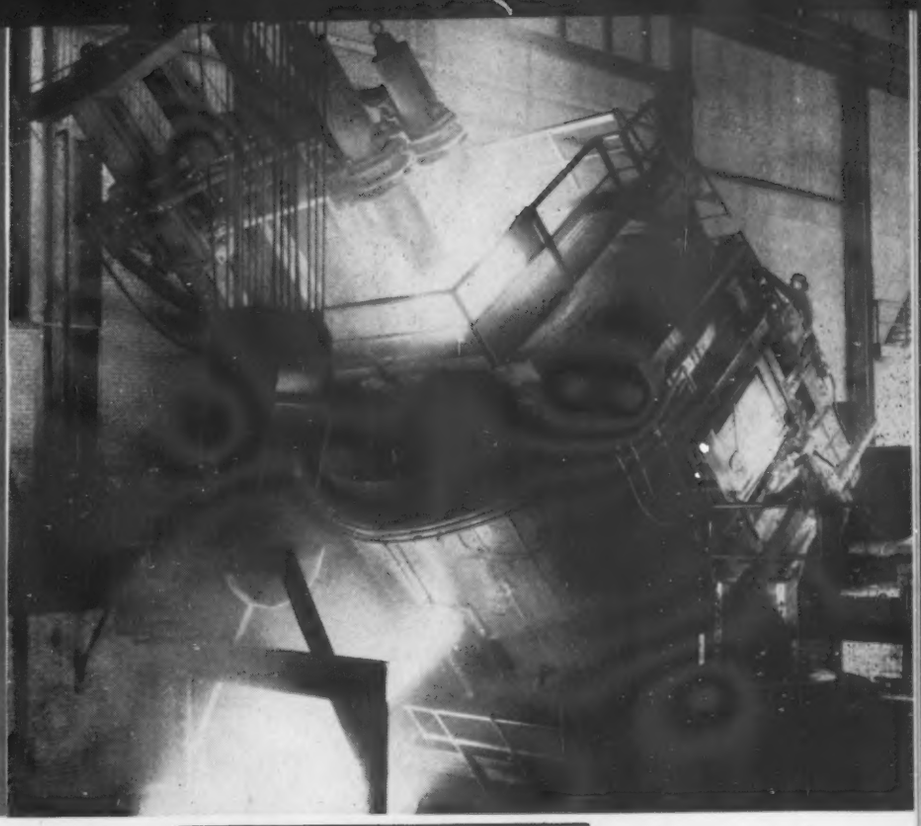
For Double Reduction Reel Drives

United engineers selected SKF Spherical Roller Bearings for this 250 h.p. Double Reduction Reel Drive because SKF Bearings do the job *right*. Self-aligning to compensate for deflection, these bearings have high capacity that's always available to carry the heavy loads on the overhung reel. They're on the job *continuously* throughout a long life. They need only occasional lubrication . . . never any adjustments. The trade-mark "SKF" is *your* guide to the right bearing in the right place.

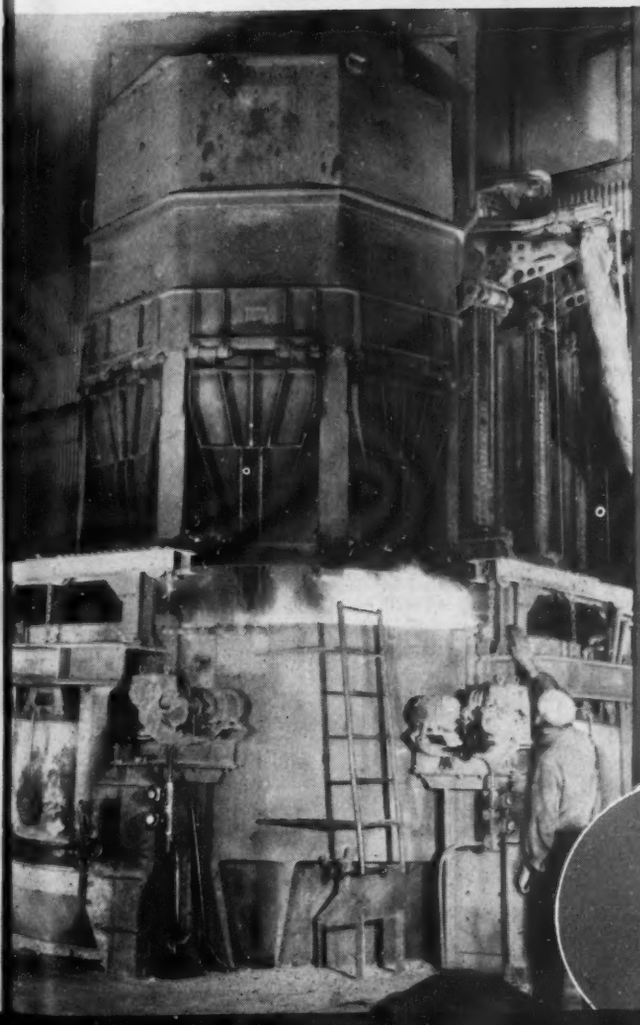
6209

SKF INDUSTRIES, INC.
Front St. & Erie Ave., Philadelphia 32, Pa.

EVERY PRODUCTIVITY ADVANTAGE



SWINDELL



Electric Arc MELTING FURNACES

- SIMPLICITY OF CONTROL for operating economy.
- SMOOTH, COORDINATED OPERATION for high production rates.
- STURDY CONSTRUCTION for dependable long life.
- SPECIALLY DESIGNED for individual plant and power conditions.

Let us work with you on your coming requirements!

SWINDELL-DRESSLER *Corporation*

P. O. BOX 1888 · PITTSBURGH 30, PA.

WHERE *Production Time* IS GAINED

GETTING PARTS FROM ONE PROCESS TO ANOTHER WITH NO WASTE MOTIONS

This conveyor brings assembled engine blocks from assembly line to the roller conveyors where they are distributed to final assembly and test. A heavy task simplified.

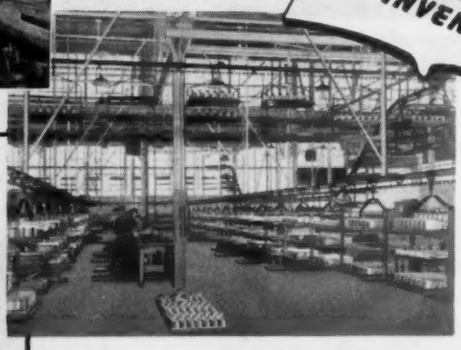
REDUCING NUMBER OF TIMES PARTS ARE HANDLED

No unnecessary handling of parts is required here. An MHS Eleveyor is conveniently at hand to receive parts as finished by operator. They go on to the next operations without loss of time.

BY PROPERLY COORDINATING OPERATIONS FEWER MACHINES CAN BE USED

Monoveyor travels in lowered position to bring proper carrier flush with benches to make it easier for operator to work on these core strips for radiators.

BY SUBSTANTIALLY DECREASING WORK-IN-PROCESS INVENTORY



Conveyors keep work on the move constantly. Money is not tied up in inventories built up to meet specific quotas Floors are always neat to help workers produce better work at greater speed.

WORK CARRIERS SAVE TIME AND CUT COSTS

Coming off conveyors, work can be placed directly on work carriers, thereby making it ready for immediate shipment or for storage without further handling. Work carriers also facilitate the handling of batch shipments.

Recommendations of carrier that will best suit your purposes furnished promptly, together with cost. Send for detailed folder, Bulletin R-4.

LOOK INTO ADVANTAGES OF MECHANICAL HANDLING *particularly* MHS

We can help you eliminate waste motions in production by organizing your work so it is brought to the right place in the right form at the right time—tying together the processing, handling, and conveying to bring you greater production at less cost with less effort—and at the same time maintain high quality.

We engineer and build complete handling systems designed to meet your particular problem, and also furnish standard equipment, both fixed and portable units, such as: Power-Driven Overhead Monorail; Apron Conveyors; Slat Conveyors; Belt Conveyors; Roller Conveyors; Floor Conveyors; TwinVeyor; RopeVeyor.

MHS

MECHANICAL HANDLING SYSTEMS, INC.

Manufacturing Engineers

Plants at Detroit and Chicago—Sales Offices at

4600 Nancy Avenue, Detroit 12, Michigan
1065 Commercial Trust Bldg., Philadelphia 2, Penna.
120 S. LaSalle Street, Chicago 3, Illinois

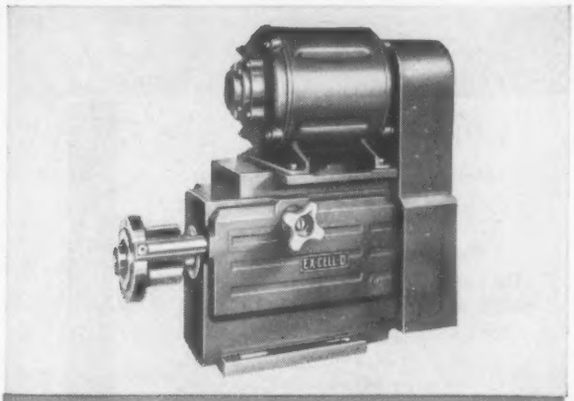
It's New! It's Small! It's Hydraulic!

Ex-Cell-O Style 20 Hydraulic Power Unit. The spindle head has a straight hole with a keyway and set screw. The quill is provided with oval holes and a pilot diameter for flange mounting to other machining units.

EX-CELL-O Style 20 Hydraulic Power Unit for High Spindle Speeds and Fast Operating Cycles . . .

Ex-Cell-O's Style 20 Hydraulic Power Unit is designed for the high spindle speeds required for operating small diameter tools efficiently. It is built to stand up under continuous, fast operating cycles. The automatic cycle includes rapid approach, two infinitely variable dial adjustable feed rates, and rapid return and stop. The unit is arranged for electric start and emergency return control.

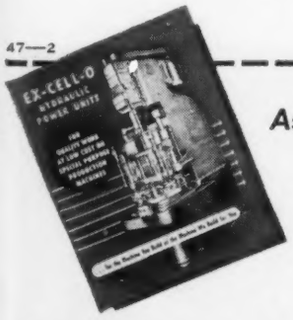
All Ex-Cell-O Hydraulic Power Units are easily installed; easily rearranged when production needs change. As a result, it is possible to use the units over and over again, and spread the original cost through years of operation. The units require minimum maintenance; ordinarily, the only care necessary is the replenishing of the hydraulic oil.



TWO OTHER SIZES—MEDIUM AND LARGE

Ex-Cell-O makes two other size hydraulic power units—(above) Style 21 (over-all length, without guard, 22¼") and (below) Style 28-A (over-all length, without guard, 38¼"). They are compact and self-contained for ease in installation. They have infinite feeds for proper cutting and provide ample power for multiple-head operation. Contact your local Ex-Cell-O representative today to see how Ex-Cell-O Power Units fit into your production program.

47—2



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EX-CELL-O for PRECISION

Ask For This FREE Book Now!

New Ex-Cell-O Bulletin gives full details on all Ex-Cell-O Hydraulic Power Units. Shows how they can be profitably applied to your production problems. Write for a copy today . . . ask for Bulletin No. 45361.

EX-CELL-O CORPORATION

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Macwhyte also makes: MACWHYTE PREformed and Non-PREformed Internally Lubricated Wire Ropes... MONARCH WHYTE STRAND Wire Rope... Special Traction Elevator Rope... Stainless Steel Wire Rope... Monel Metal Wire Rope... Galvanized Wire Rope... Hi-Fatigue Aircraft Cables, Assemblies and Tie-Rods. *Catalog, literature on request.*

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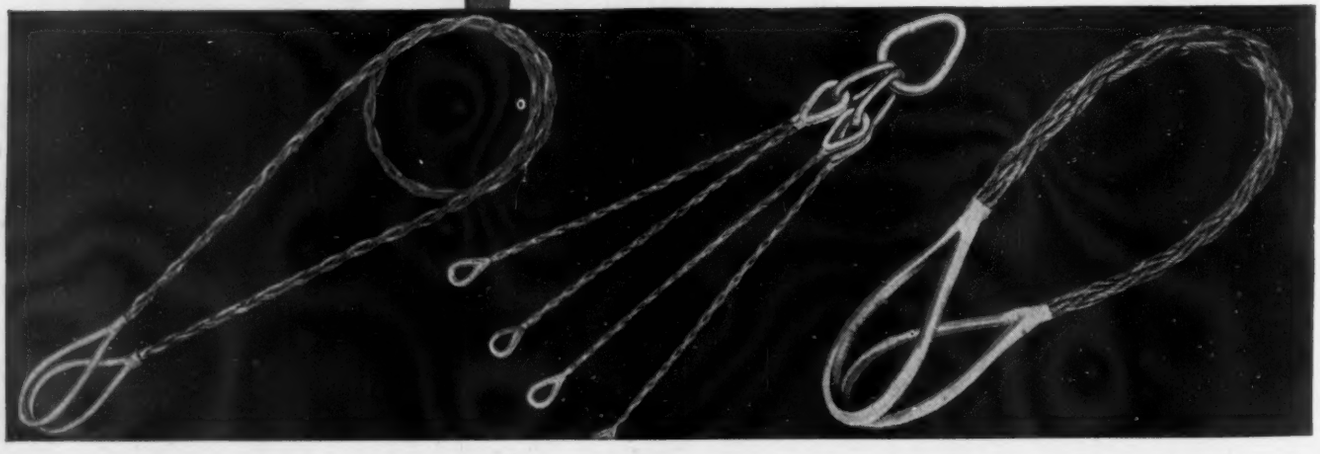
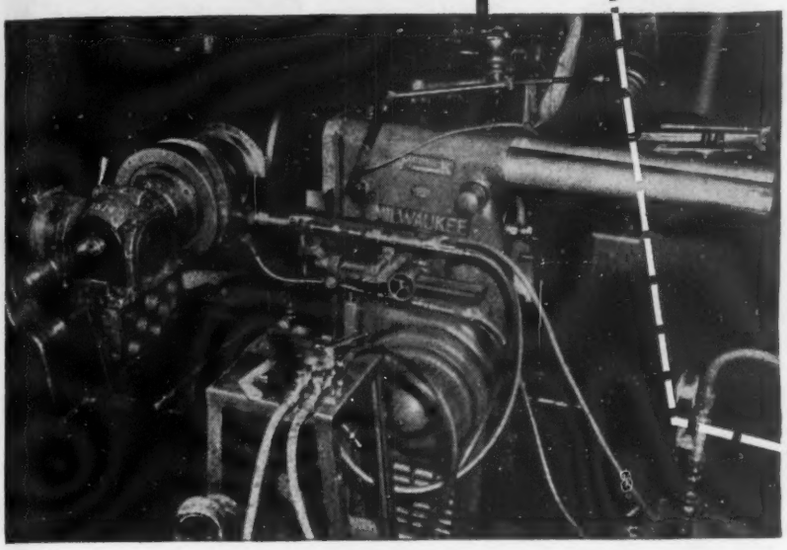


how to lengthen the life of machine tool parts

by Airco Flame Hardening



PART: Cam Track in Barrel Cam
MATERIAL: Meehanite
HARDNESS OBTAINED: 62 Rockwell "C" 86 Scl.
DEPTH OF CASE: 1/8 inch
SET-UP (Change-over) TIME: 3 hours
CYCLE TIME: 20 minutes
DISTORTION: None measurable
Performed on Kearney & Trecker 2K Universal Horizontal Milling Machine with cam-milling saddle. Standard Airco tapered cylindrical tip, flame-hardening torch, universal adjustable bracket, and accessories used.

Milling machine converted to flame hardener in 3 hours, barrel cam hardened in 20 minutes

HOW IT WAS DONE — After cam was milled, holder and torch were clamped to column face of milling machine. Both sides of cam track were flame hardened in one revolution with the identical set-up used in machining the cam. Since contours followed in hardening were identical to those in milling, uniform hardness and depth of case were achieved.

Because of mass of the barrel cam, certain extra precautions were used. The coolant was circulated through a refrigerating unit mounted at rear of machine. An auxiliary quench was used. Baffle plates deflected heat from machine and dividing-head surfaces. No measurable distortion occurred. No damage resulted to milling machine or attachments used.

This is typical of the type of equipment that can be flame hardened to extend service life. Flame treatment does not effect properties of the core — wear-resisting surfaces are produced while still retaining the toughness and ductility of core material. Distortion is so negligible that hardening is normally done after finish grinding.

Airco flame treating can be economically applied to single parts or to units in mass production. Normally standard machine tools, with standard Airco oxyacetylene equipment, are all that is needed.

If you are making or using parts that will give longer life when surface hardened, fill in and mail the coupon for copies of Oxyacetylene Flame Hardening Handbook and Flame Hardening Apparatus Catalog No. 90. Air Reduction, General Offices, 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, General Offices: Houston 1, Texas. Represented internationally by Airco Export Corporation.

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(I)—2

Announcing
Manufactured under Patent No. 1,865,169, owned by The Reid-Avery Company, the patent covering the multiple longitudinal groove feature of this type of electrode.

RACO COMPOSITE TYPE A

THE NEW AND REVOLUTIONARY ELECTRODE FOR AUTOMATIC ARC WELDING

RACO Composite Type A is a heavily coated electrode *in coils*, providing the same physical results as heavily coated manual electrodes. With RACO Composite Type A, extremely high speeds can be obtained in any position.

It can be used with all standard automatic arc welding heads without alterations or additions.

RACO Composite Type A can be had with any of the following coatings—A.W.S. 6012; A.W.S. 6020; A.W.S. 6030*. This electrode can also be had in three grades of hard surfacing material for building-up—RACO 25 (20-25 Rockwell C), RACO 45 (40-50 Rockwell C) and RACO 55 (50-60 Rockwell C). RACO Composite Type A Electrode is furnished in the following sizes: No. 6 (approx. 1/4"); No. 5 (approx. 7/32"); No. 4 (approx. 3/16"); and No. 3 (approx. 5/32"). Coils are 36 inches I.D., and weigh 150 to 200 pounds net.

The manufacture of RACO Composite Type A Electrode is one continuous operation embodying the following steps: 1) a round wire is drawn to predetermined size; 2) we deep-groove the round wire to a standard shape for all sizes; 3) we then draw and wrap six contact wires around the special shape and extrude coating on same. Result—RACO Composite Type A Electrode, eliminating slitting shielded arc coatings to obtain contact with wire . . . doing away with wrapping shielding materials on wire during operation . . . banishing troublesome recovery of unused melt.

Send for price and delivery information now . . .

*and A. W. S. 7020, 7030, 8020, 8030, 9020, 9030, 10020, 10030.

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IT MUST FIT YOUR JOB

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JOB-FITTED STEEL

Best fitted to do a specific job for a specific customer at a specific time — and all factors considered, at lowest cost.

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ALUMINUM SHEETS and STRIP—available through locations marked

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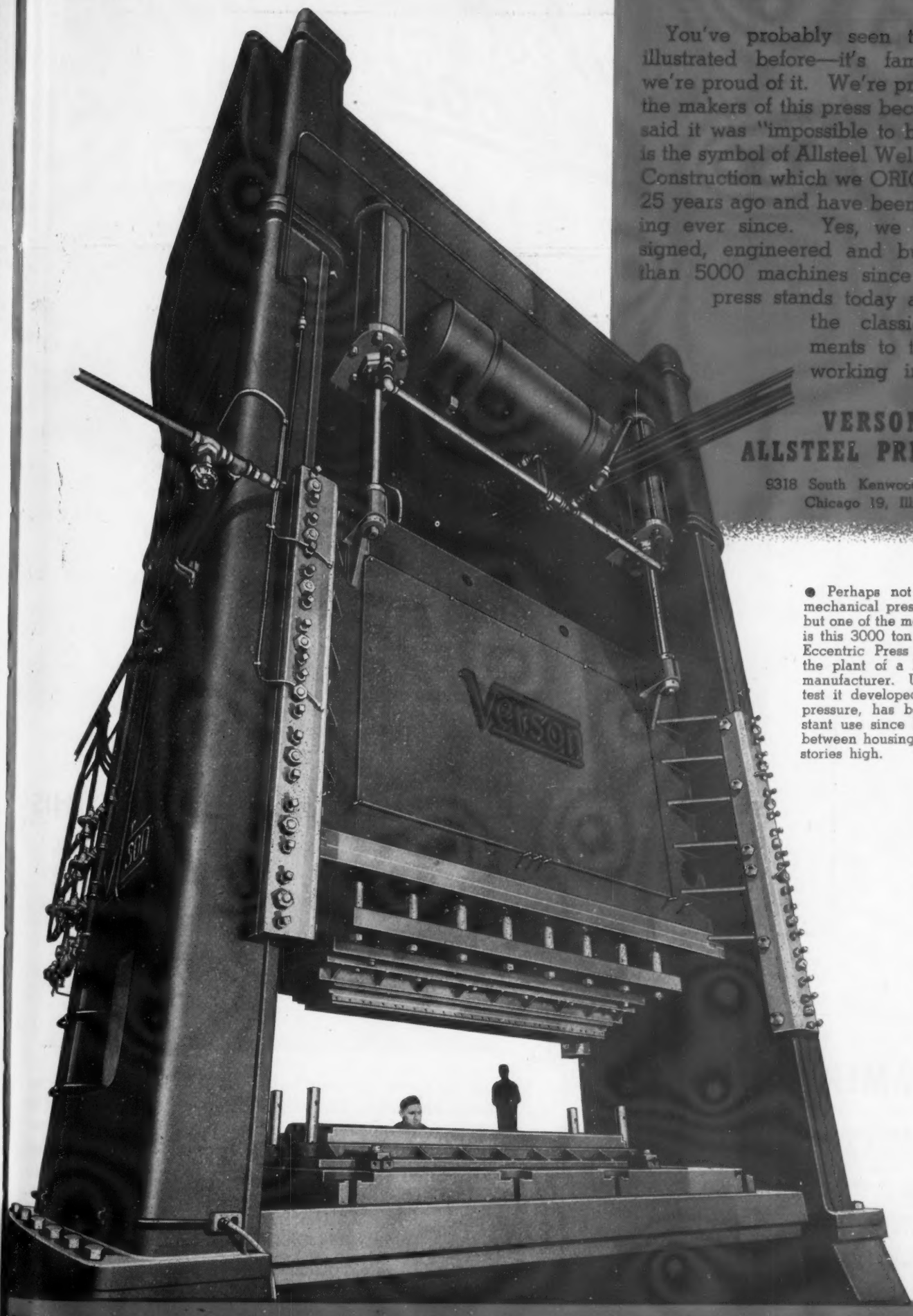


You've probably seen this press illustrated before—it's famous and we're proud of it. We're proud to be the makers of this press because they said it was "impossible to build". It is the symbol of Allsteel Welded Press Construction which we ORIGINATED 25 years ago and have been pioneering ever since. Yes, we have designed, engineered and built more than 5000 machines since but this press stands today as one of the classic monuments to the metal working industries.

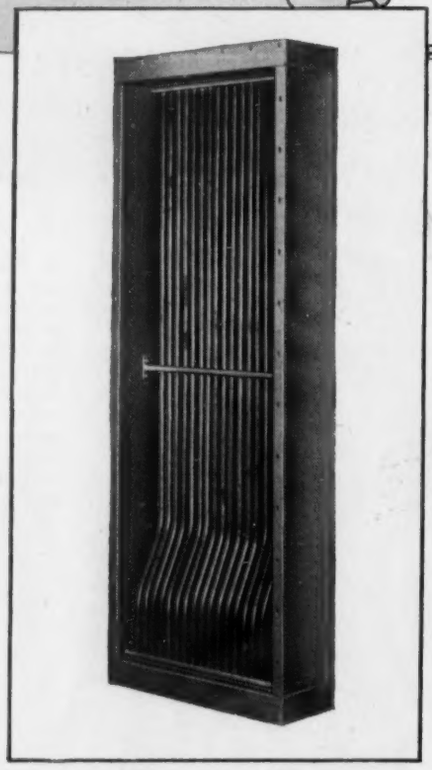
VERSON ALLSTEEL PRESS CO.

2318 South Kenwood Avenue
Chicago 19, Illinois

● Perhaps not the largest mechanical press ever built, but one of the most powerful, is this 3000 ton Verson Full Eccentric Press installed in the plant of a large casket manufacturer. Under actual test it developed 4500 tons pressure, has been in constant use since 1935. 154" between housings, it is three stories high.

POWER PRESSES ★ CLUTCHES ★ FORGING PRESSES ★ DIE CUSHIONS ★ HYDRAULIC PRESSES ★ PRESS BRAKES

Before you select ANY COIL



New American Blower Heating Coil

1 CHECK THE MAKER

When choosing the heating or cooling coil that will do the best job for your specific installation first consider the engineering background and reputation of the maker. You'll find in short order that American Blower is one of the oldest and largest designers and manufacturers of air handling, air conditioning, heating, cooling and cleaning equipment.

2 Then the next step . . . DO THIS

Send for these two new bulletins, prepared by American Blower engineers. They make the work of selecting the best in coils quicker and easier. We've been told these bulletins are the most convenient guides and references ever printed on the subjects of coil selection, sizing and installation. All material is authoritative and up-to-the-minute. Here's all the information you will need in concise, easy-to-understand form.

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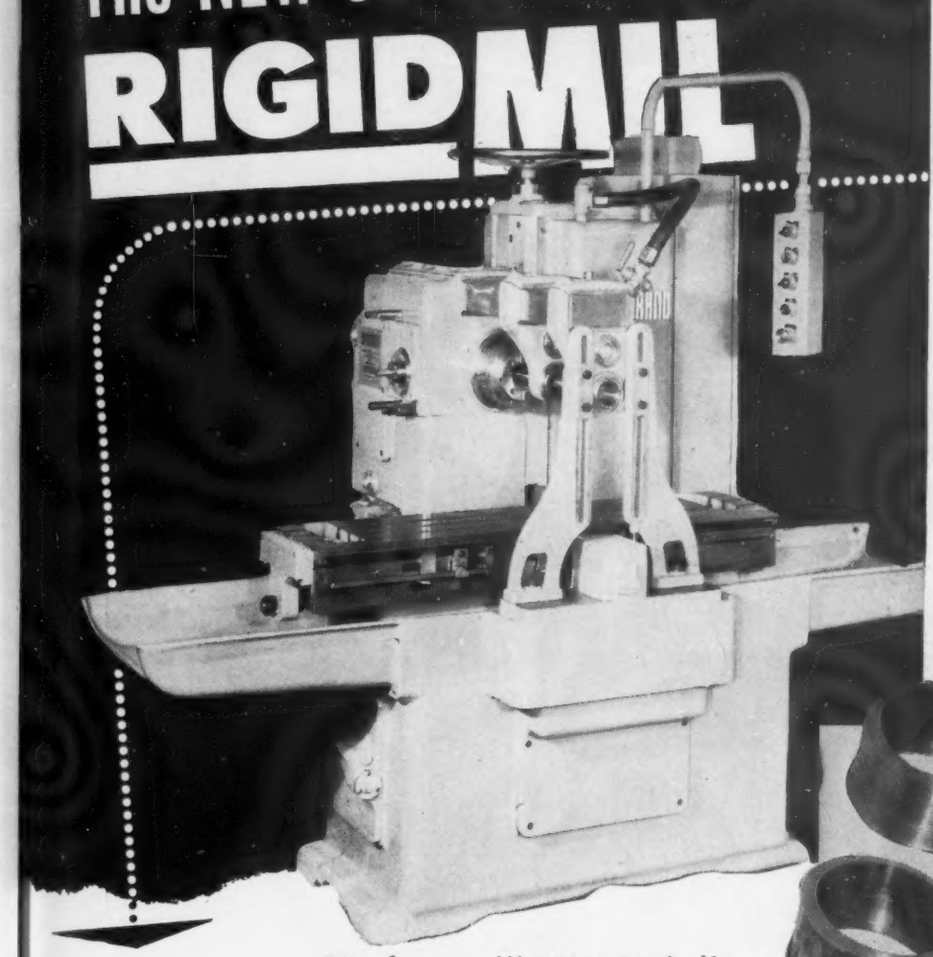
DESIGNED TO HANDLE COUNTLESS MILLING OPERATIONS AND PROFITABLE METHODS . .

The NEW Sundstrand Model 22 RIGIDMIL



Yes, features like 80 to 1 spindle speed ratio, 100 to 1 feed ratio, 300 inches per minute rapid traverse and Climb and Conventional Milling, are all incorporated in the design of this new Rigidmil. In addition, pendant control facilitates ease of operation and unit construction provides possibilities for duplex type mills and vertical spindles.

Like all Sundstrand Rigidmils, the basic design is such that it can be adapted to countless milling operations and methods. Sundstrand *Engineered Production* offers proper methods and production at minimum cost. Investigate it further now!

MORE FACTS FREE

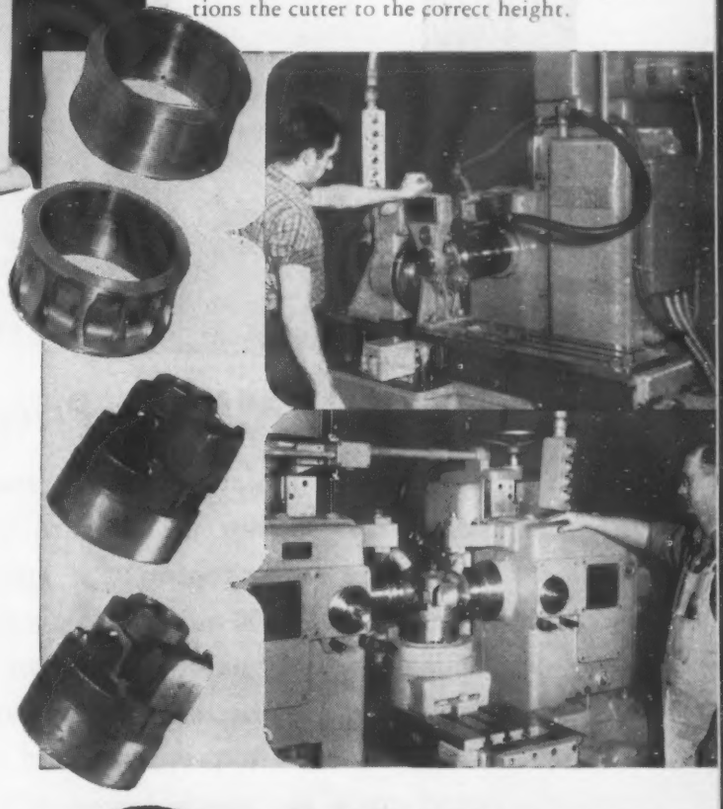
Get this new booklet today. It contains specifications and additional data on this new Sundstrand Miller. Write today, ask for bulletin No. 756.

STANDARD SUNDSTRAND ATTACHMENTS Add to the Versatility of This Machine

The two jobs illustrated below are good examples of the versatility of the Model 22 Rigidmil. This flexibility makes it possible to adapt the machine to a wide variety of milling methods on small and medium size work.

USING AUTOMATIC INDEX BASE Milling time was cut from three hours per cylinder sleeve to 7.5 pieces per hour. This increased production is due largely to the use of a standard Sundstrand automatic index base in conjunction with a standard vertical feed attachment. These provide a complete automatic cycle for milling 12 grooves in each cylinder sleeve.

DUPLEX TYPE WITH AUTOMATIC INDEX BASE. In this case a standard duplex type Model 22 Rigidmil is provided with a standard Sundstrand automatic index base attachment. Four different surfaces of the compression block are thereby machined in one handling. Two passes of the table completes the milling of all four surfaces. Because one pad is at a different height, the lefthand head is equipped with a standard vertical feed attachment which automatically positions the cutter to the correct height.



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SUNDSTRAND MACHINE TOOL COMPANY

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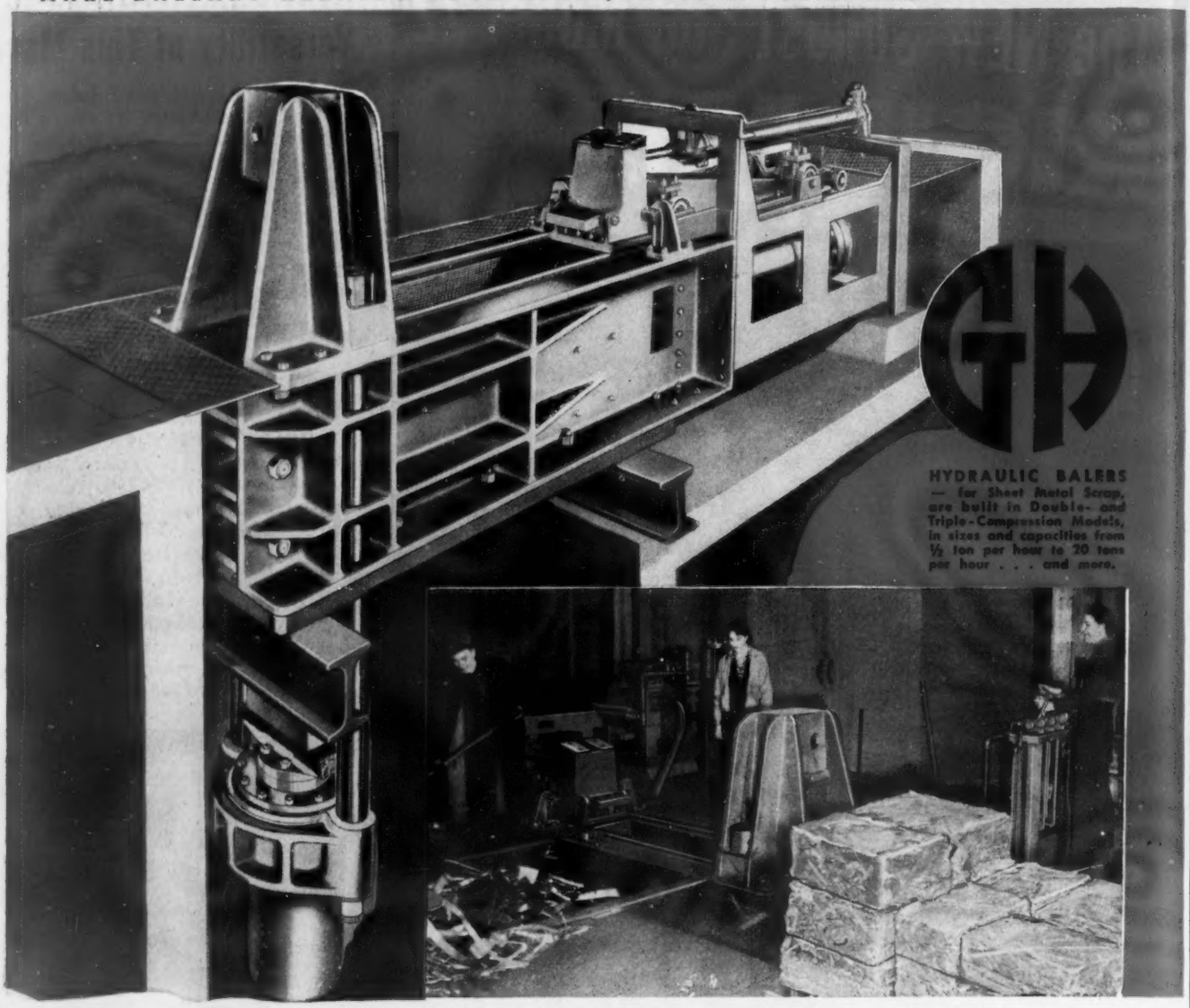

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Baled sheet metal scrap consistently commands higher prices than loose stampings and clippings . . . usually from $4.00 to $6.00 more. What's more, with an orderly salvage program . . . built around efficient baling equipment . . . handling, storage and shipping costs are much lower. The result is a profitable salvaging operation.

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GALLAND-HENNING

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Thor

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14,000 r.p.m.

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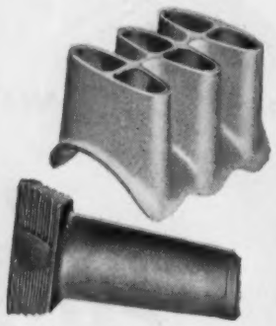
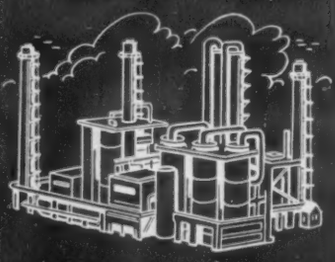
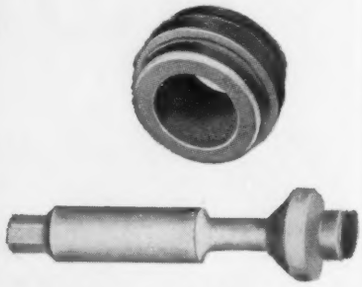


Petroleum

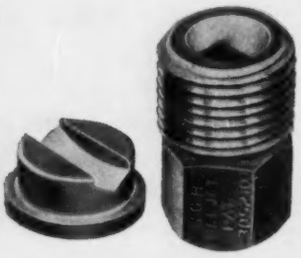


Valve Parts Used in Petroleum Refinery



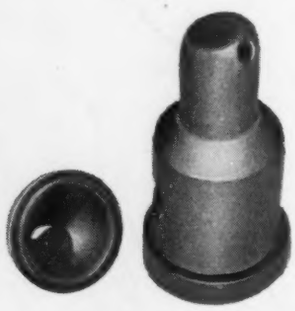
Chemical

Spray Nozzle Parts for Handling Corrosive Chemicals

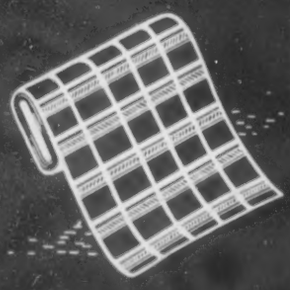


Diesel Engines

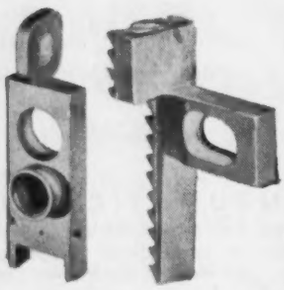
Diesel Engine Parts



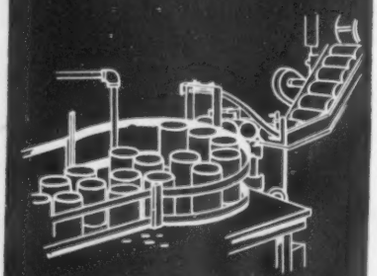
Textile



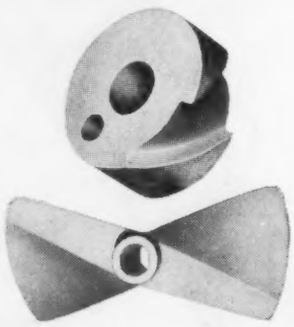
Left: Cloth Cutting Slide
Right: Sewing Machine Feed Dog



Food Processing

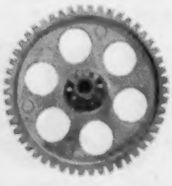


Top: Canning Machinery Part
Bottom: Impeller



Metalworking

Left: Scarfing Blowpipe Head



Right: Gear for Steel Mill Pickling Tank

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TRADE-MARK
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HAYNES precision castings

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You can now specify parts produced from alloys that dominate the field where high strength and resistance to heat, corrosion, and abrasion are required. Parts can be engineered for performance rather than convenience of fabrication, since intricate parts can be produced economically by the HAYNES precision casting process. HAYNES precision castings are uniform in quality, size, contour, and finish.

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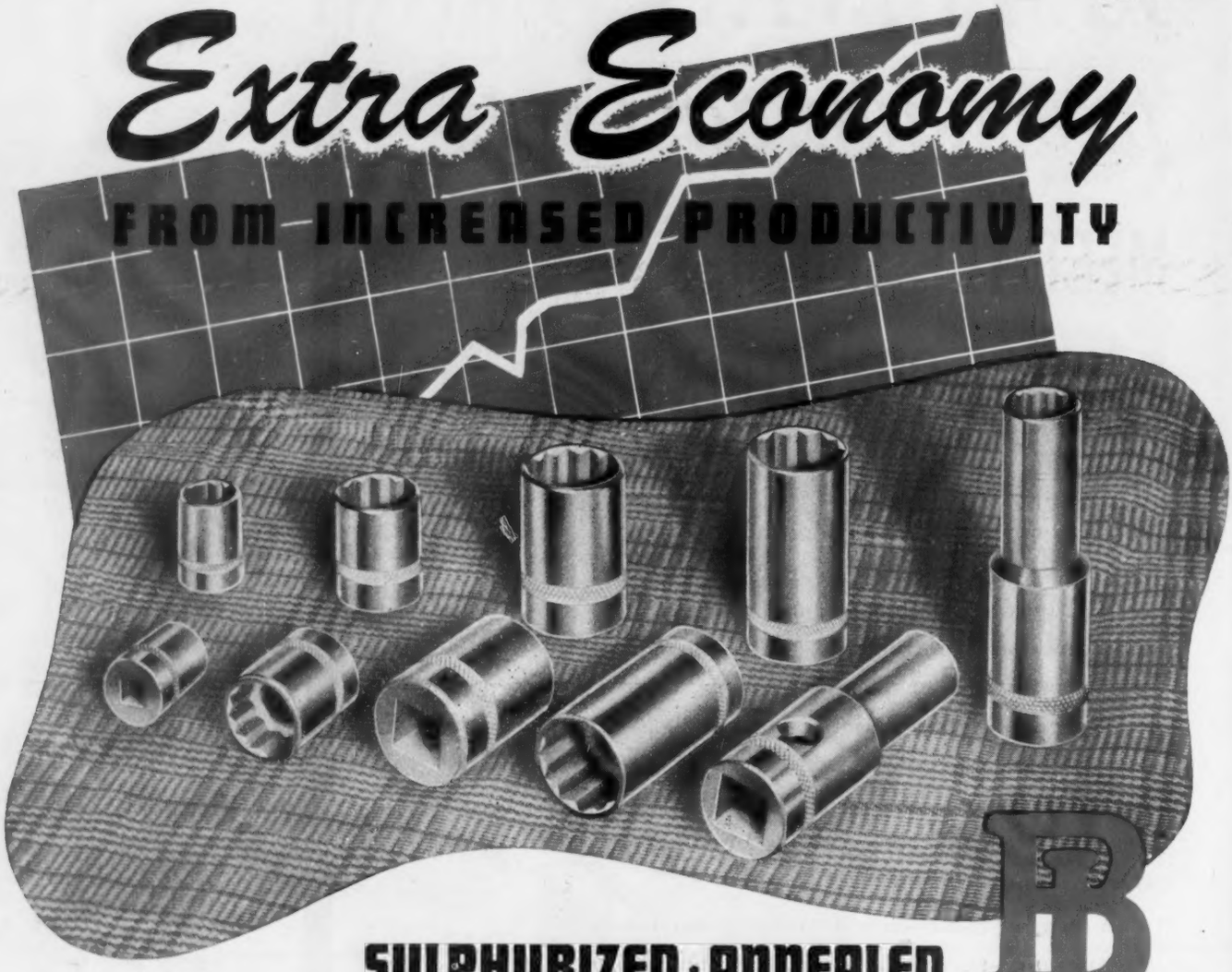

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How to maintain reasonable profits in the face of rising costs . . . that is one of industry's big problems in the critical year ahead.

The answer may be found in the use of improved types of steels . . . like B&L *sulphurized* Alloy Steels whose free cutting qualities permit important savings in the fabrication of parts and shapes.

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BLUEDAC	All Position, A.C. Current	A.W.S. 6011
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GRAY DEVIL No. 2	General Purpose, Smooth Bead Straight Polarity Also A.C. Current	A.W.S. 6013
BLACK DEVIL	Deep Grooves and Horizontal Fillets Straight Polarity	A.W.S. 6020 A.W.S. 6030
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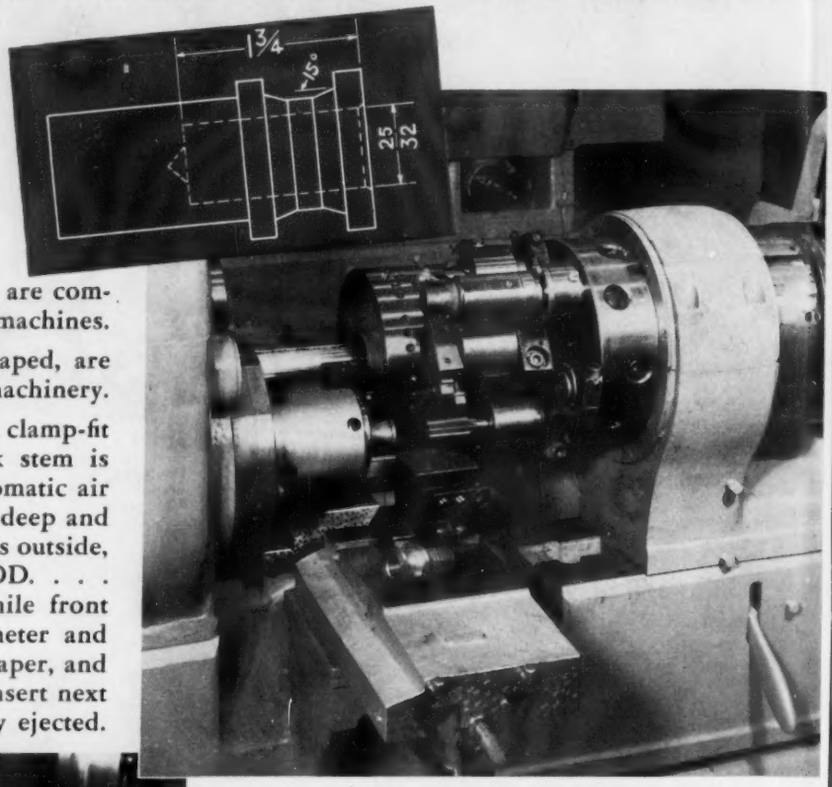

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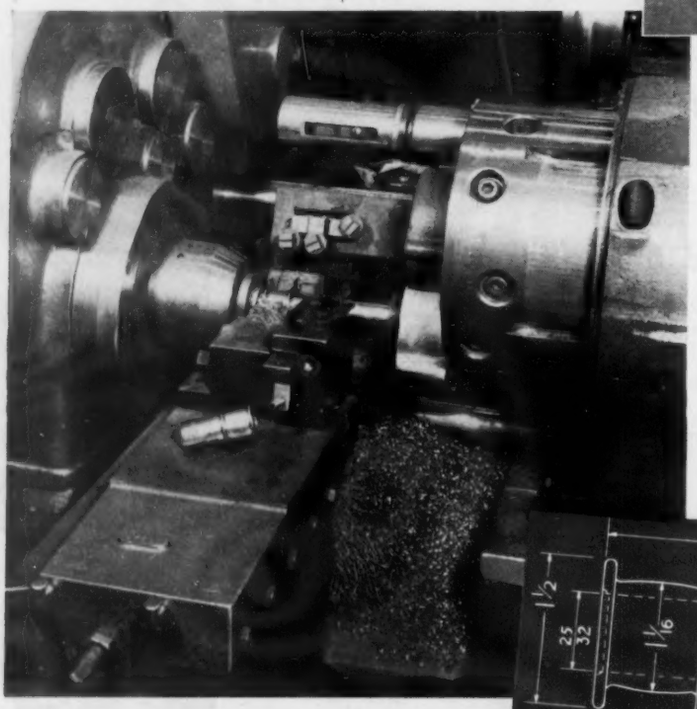

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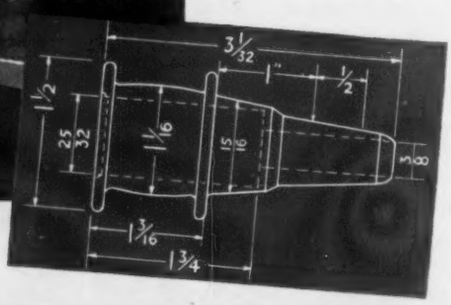

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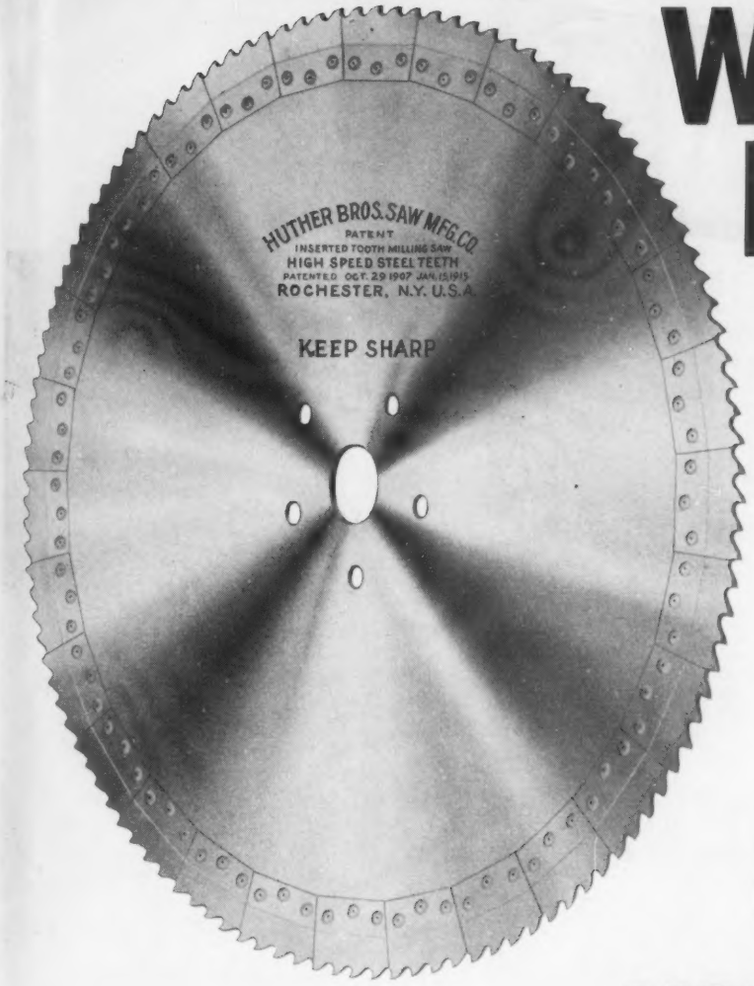

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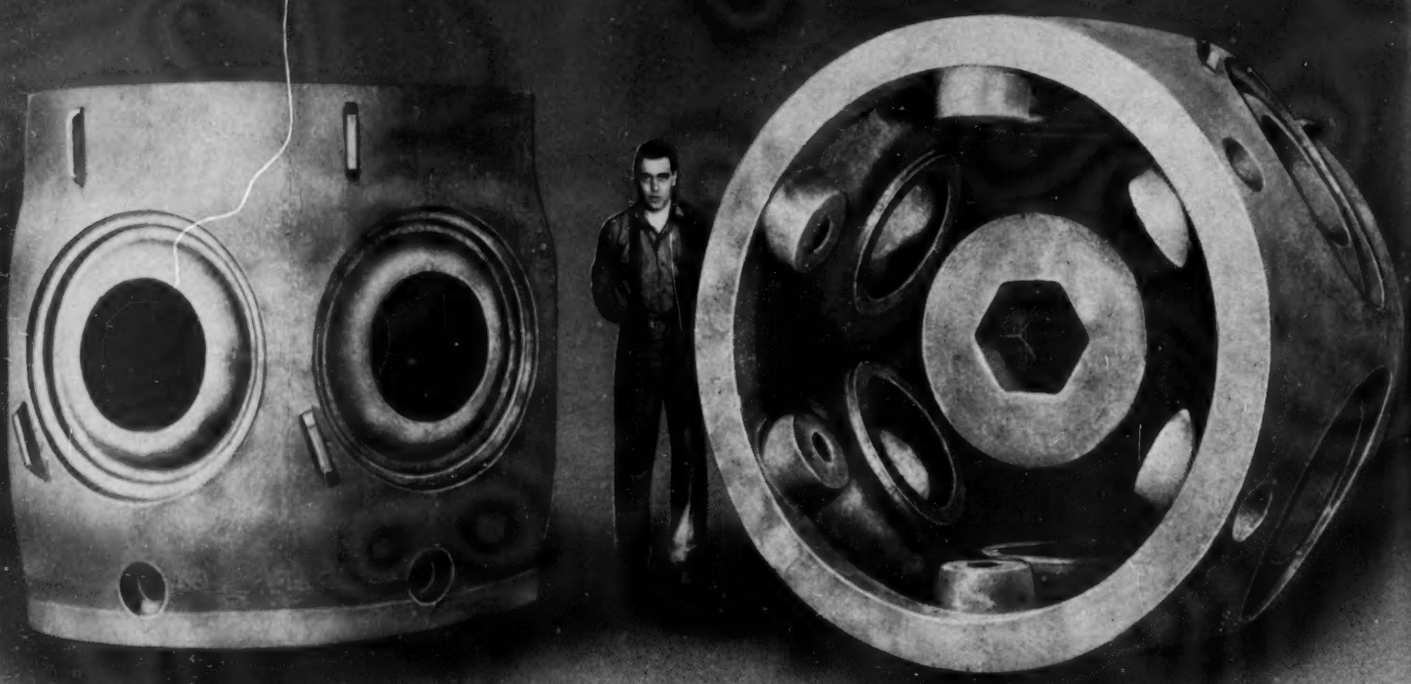

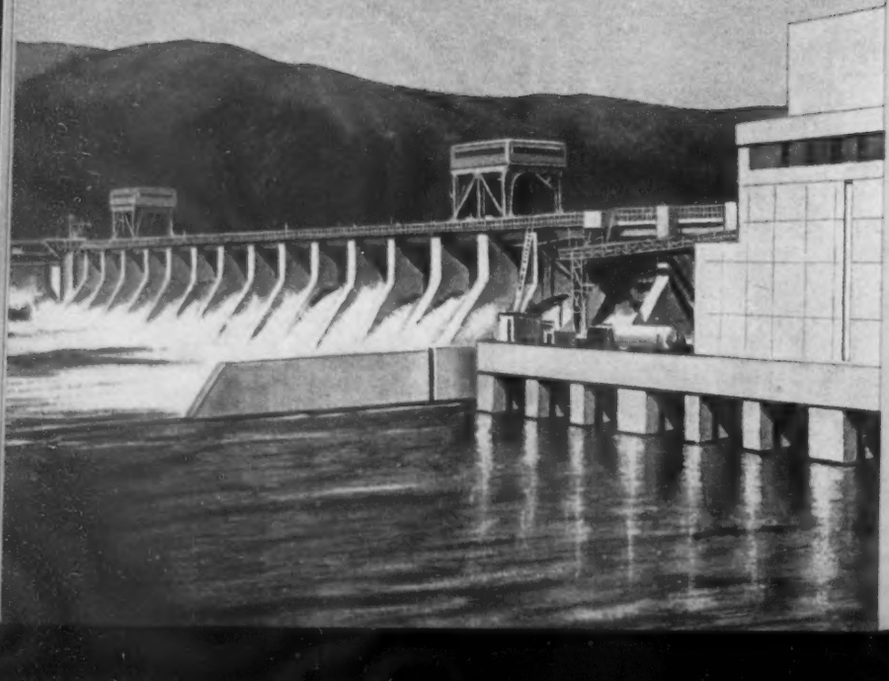

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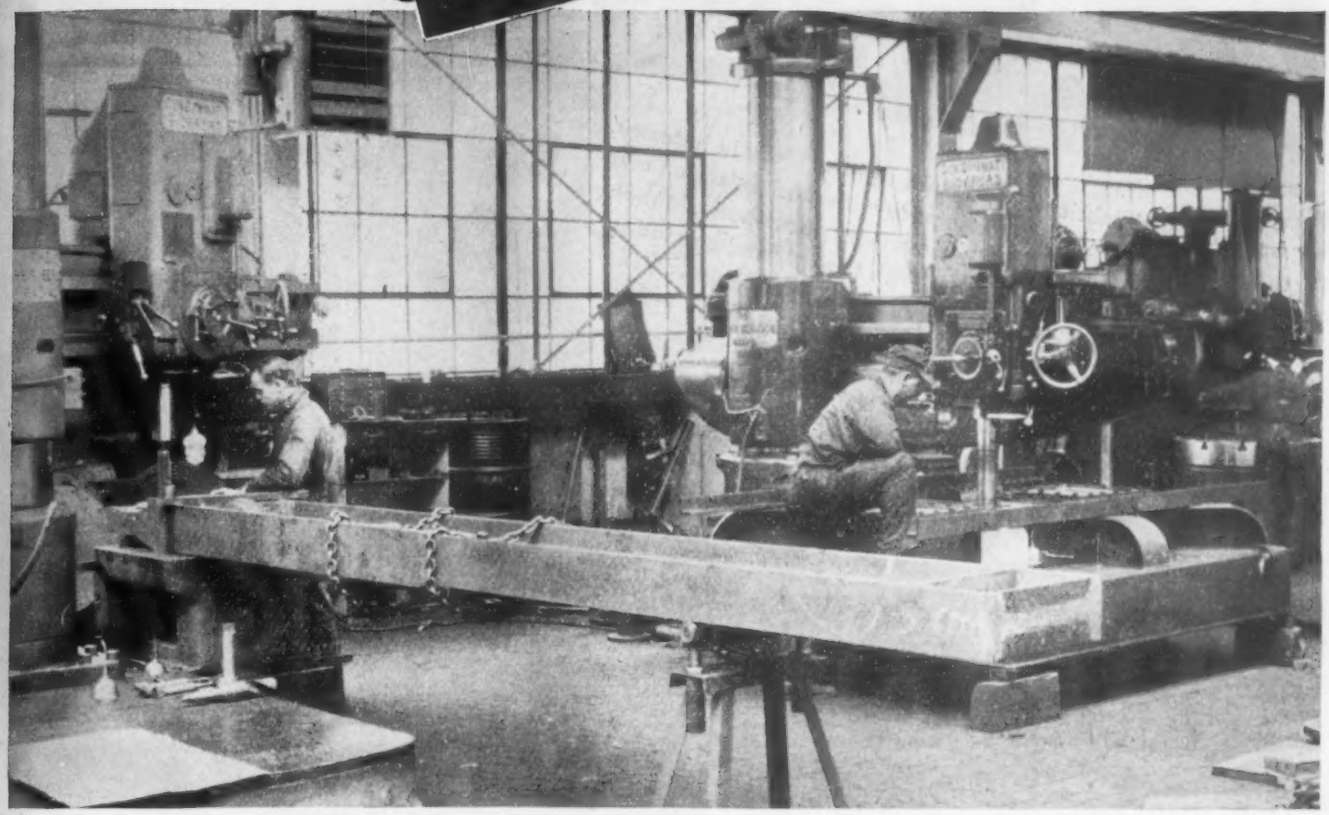

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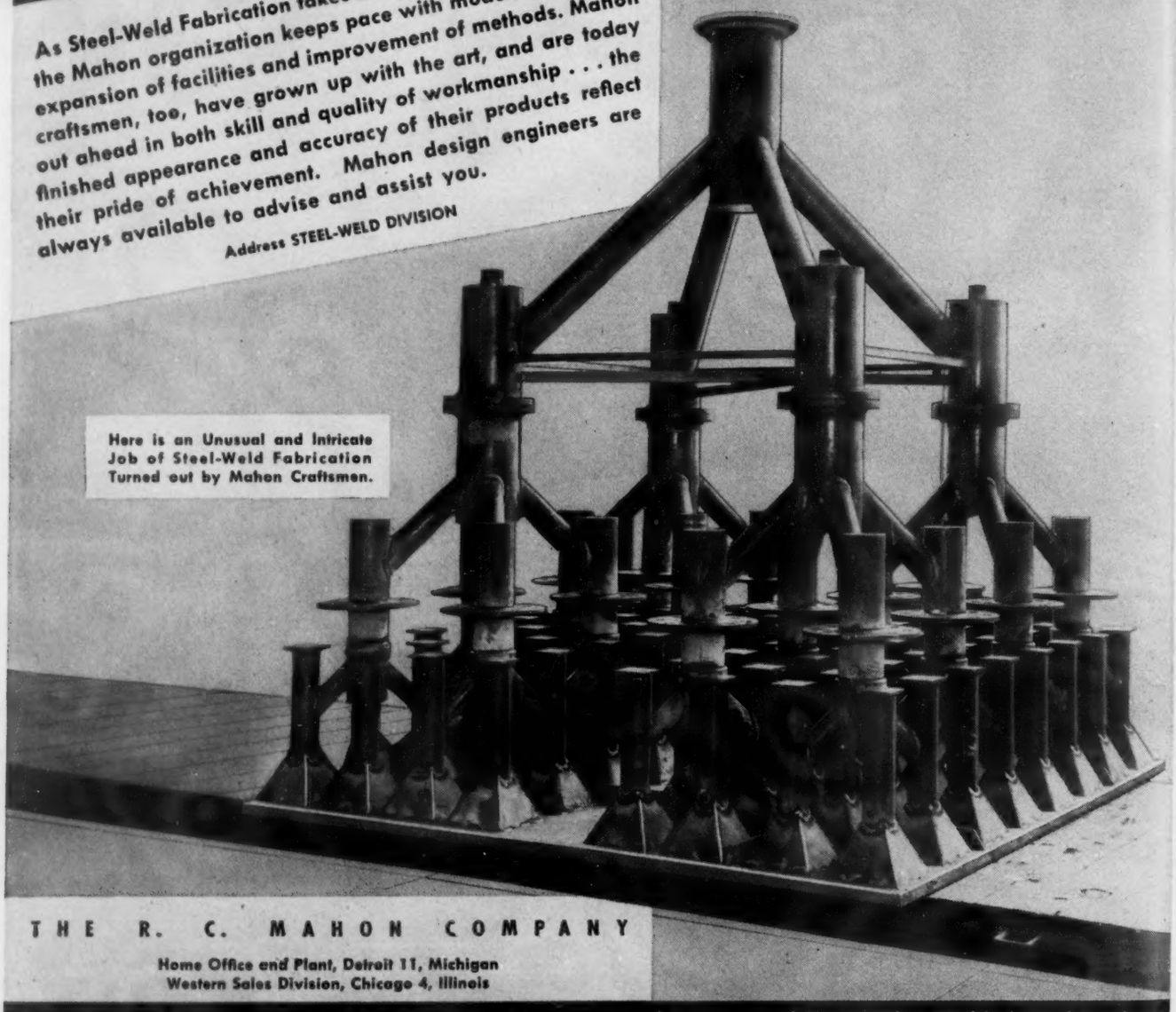

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Pressure-Welding Steel Rings
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STEEL

The Magazine of Metalworking and Metalproducing

JANUARY 6, 1947

Volume 120—Number 1
1947 Yearbook of Industry Issue
Price $2.00 per copy

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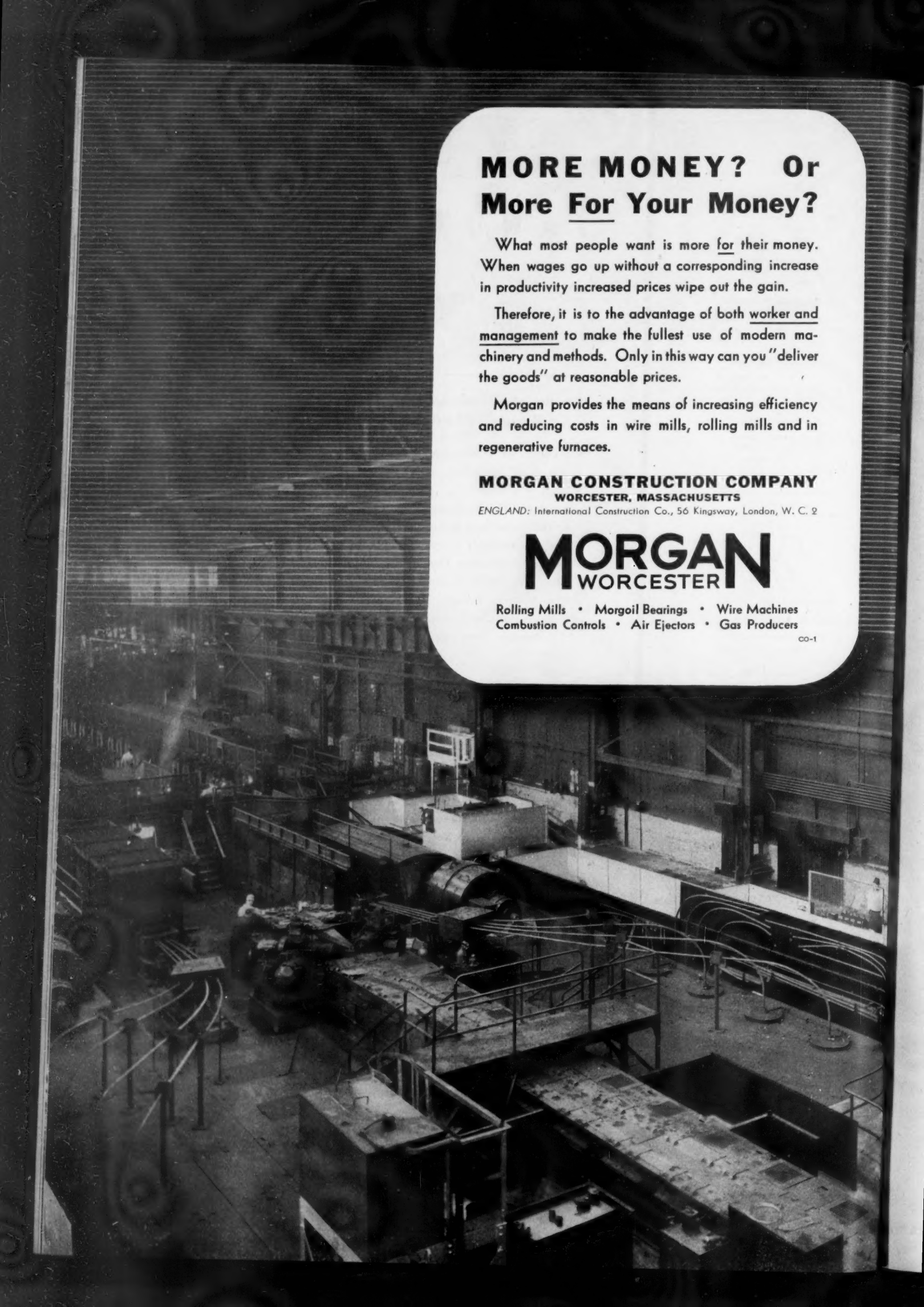
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January 6, 1947

Outlook Is Clearer

As American industry goes into the new year, it finds the obstacles to progress somewhat less formidable than those encountered a year ago.

At the beginning of 1946, industrial executives were chiefly worried over two uncertainties. One was that the federal government, after having evidenced a desire to remove wartime restraints and controls as rapidly as possible, apparently changed its mind and was in the process of trying to perpetuate the government regulation of business in peacetime. The second uncertainty was the attitude of labor. At the beginning of 1946 union leaders were demanding substantial wage increases on the plea that they could be granted by employers without compensating increases in prices.

Events in 1946 proved conclusively how seriously these two blunders—one by government and one by labor aided and abetted by government—affected industrial operations and impaired the economy of the nation. In fact, the situation became so bad that the people, fed up with futility, called a halt to foolishness in their votes of Nov. 5.

This revolt of the people has brought about a number of encouraging changes in national affairs. Among other things it has forced the government administration to part with its left wing obstructionists, to belatedly abandon many wartime controls and to withdraw partially at least from its former position of working hand-in-hand with labor minorities against the interests of employers and the public.

Thus, as industry faces 1947, one of the uncertainties of early 1946 has been eliminated and the other has become less complicated. The threat of continued unnecessary controls is on the way out. The labor situation is simplified by the fact that Washington seems to be less inclined to be an unfair umpire on labor's side.

If Washington will stand pat on its apparent desire to wash its hands of labor relations, then the problem of working out differences between employers and unions in 1947 will fall upon the shoulders of the principals. In that case a great burden of responsibility must be assumed by the unions. With their knowledge of how destructive and futile their tactics were in 1946 and with the realization that a misguided left-wing contingent in Washington is not at their beck and call, they may think twice before repeating in 1947 the blunders they committed in 1946.

The outlook for economic progress in the new year is not clear, but it is much less confused than it was a year ago.

* * *

SEE GOOD YEAR AHEAD: If you, a reader of this page, had had the time and opportunity in November to interview the top men in management in the metalworking industries as to their expectations for 1947, you would have felt that the answers you received should give you a pretty reliable forecast of business in the new year. This would have been particularly true if your interviews had been distributed among the executives of more than 2500 plants, scattered widely geographically and well diversified as to size and as to nature of products manufactured.

Our editors have done this big job of interviewing for you. The results are extremely gratifying. In spite of their known penchant for conservatism, executives in the metalworking industries envision in 1947 a volume of production that will exceed that of 1946 by 27.5 per cent. This means an output of goods valued at $55 billion, compared with $43 billion in 1946 and $19 billion in 1939. They expect employment in their plants will total 5,126,000—a new peacetime high. They plan to increase capacity by 16.8 per cent over 1946. They see a trend toward two and three-shift operation, small

(OVER)

gains in worker productivity, moderate increases in costs and selling prices and an all-out effort to increase efficiency in manufacturing operations.

Executives are not disposed to sell American industry short in 1947!

—pp. S-1 to S-32, following p. 146

• • •

RESERVOIR NOT TAPPED: One cannot read the comments submitted by the more than 150 contributors to this publication's annual forum on technical progress in metalworking without being impressed with the great quantity and high quality of the work being done in this field. This evidence of achievement is even more impressive when it is realized that the comments published constitute only a cross-sectional sampling of the work that many thousands of persons are performing in the plants and laboratories of the metalworking industries.

Many of the new technological developments of the past 18 months have been capitalized to only a limited extent because industry has not operated steadily enough to take full advantage of them. If industrial activity could be maintained uninterruptedly during most of 1947, we might be surprised at the extent of savings in costs, improvements in product and other gains that can be credited to technological progress since V-J Day.

Industry has a reservoir of "know how" that has not been tapped. —p. 211

• • •

REVIVAL IN SELLING: One of the $64 questions posed by 1947 is the extent to which production in the metalworking industries during the new year will be able to appease the world's tremendous appetite for materials, equipment and manufactured products.

At the beginning of the new year, many industrial companies reported backlogs of orders larger than at the dawn of any previous peacetime year. Domestic and export market reports indicate more business in sight than can be handled in periods ranging from several months up to number of years.

The overall picture is one of a demand that should tax productive facilities throughout the year, yet it is certain that in some lines buyers' markets will replace sellers' markets, resistance to high prices will become formidable and other competitive factors will come into play.

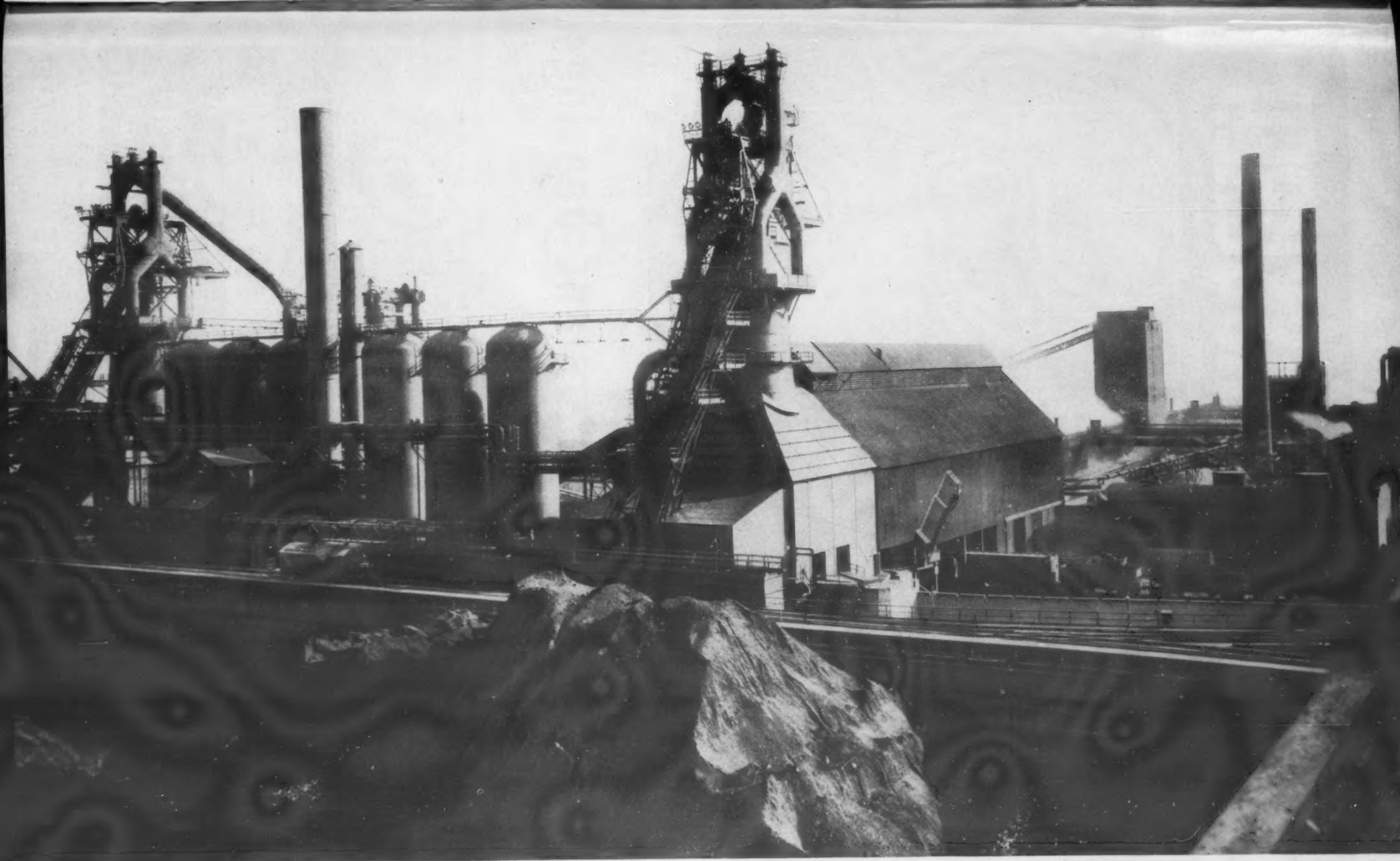
It will be unwise in 1947 to take rosy market prospects too much for granted. Sturdy selling again will be in order before the year ends.

—pp. 318, 320, 324

APT TO HAPPEN IN '47: High up on the list of "must" assignments of the Eightieth Congress (p. 179) are (1) revision of the government's fiscal affairs, (2) determination of which federal controls should be abandoned and which should be retained, (3) overhauling of labor laws and (4) eliminating uncertainty as to the line of presidential succession when the office of Vice President is vacated by death of the President. . . . Consensus of opinion in motordom is that limitations on the supply of steel (p. 191) will prevent the automobile industry in 1947 "from doing much better than four million passenger cars and one million trucks." On the basis of past performance, this would rate 1947 as a good year. . . . Outlook for world iron and steel production in the ensuing year (pp. 313, 314) is clouded by the prospect of continued shortages of coal and scrap, coupled with food and manpower difficulties in some areas. Aversion of young men to mine coal under existing conditions in England and on the Continent (pp. 313, 316) is a problem that should command priority attention in the new year. . . . Civilian employees in the United States government increased from 900,000 in 1939 to 3 million in 1943. The Seventy-ninth Congress ordered that the number be reduced to 1,600,000 by June 30, 1947. Realists think that if the federal payroll can be pruned to around 2 million by mid-year (p. 188), a near miracle will have been performed. . . . Judging from the past and looking to the future, one contributor to this publication's annual forum on technical progress in metalworking (p. 212) makes the statement that "the concepts of physics and physical chemistry continue to invade the realm of metallurgy. The metallurgist is becoming less an engineer and more a scientist". . . . Small and medium-size companies in the metalworking industries are more optimistic about profits in 1947 than are large corporations. Replies to STEEL's questions (p. S-32, preceding p. 179) indicate that companies employing less than 50 workers expect to make profits of 10 per cent on sales in 1947, whereas companies employing more than 1000 expect returns of only 7.8 per cent on sales. . . . Perhaps the soundest optimistic note in this issue is Zay Jeffries' statement that "we can face the future with faith that metals, if properly used, will provide a firm foundation for a much higher standard of living than anything experienced in the past."

E. L. Shaner

EDITOR-IN-CHIEF



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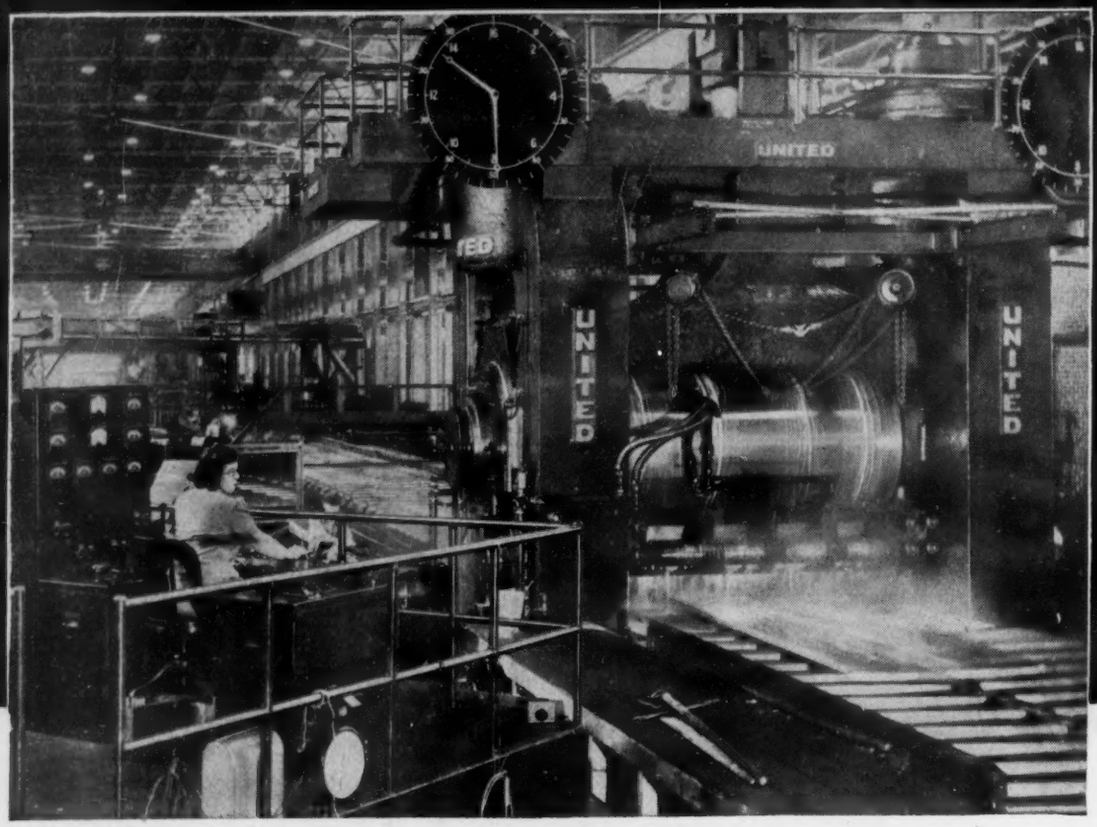

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★ **PRODUCTION**—How much will production increase in 1947? . . . How good a year was 1946? . . . How much production was lost in 1946 due to strikes and material and labor shortages?

★ **PLANT CAPACITY**—How much will plant capacity be increased in 1947? . . . In the next three years? . . . How does present capacity compare with that of 1939?

★ **EMPLOYMENT**—How many more workers will be employed in 1947? . . . How many shifts: One? Two? Three? . . . How long is the average work-week? . . . Will more workers be available? . . . Is worker productivity tending upward or downward? . . . What about wage incentive, bonus and profit-sharing plans? . . . Guaranteed annual wage plans?

★ **SHIFTS IN INDUSTRY**—What geographical shifts have occurred in production, capacity and employment? . . . What further changes may be expected?

★ **PRODUCTION COSTS**—Will unit cost of production continue upward in 1947? . . . What will industry do to increase output and reduce costs?

★ **SALES AND DISTRIBUTION COSTS**—Are sales costs expected to rise further in 1947?

★ **PRICES**—What is the expected trend in selling prices in 1947?

★ **PROFITS**—How much profit did the metalworking industry make in 1946? . . . What is the outlook?

A SPECIAL REPORT PREPARED BY THE EDITORS OF

STEEL

PENTON BUILDING • CLEVELAND 13, OHIO

Industry Sets Its Sight Hi

MANAGEMENT of the metalworking industries in the United States has not joined the parade of calamity howlers who are predicting a business recession in 1947. In spite of the discouraging current events which dominated the domestic and foreign economic scenes at the close of last year, the men who are responsible for operating the nation's metal workshops have definitely set their sights higher for 1947, believing that production and employment will establish new high records of $55 billion and 5 million workers, respectively.

This expectancy, which runs so contradictory to the pessimistic forecasts of most economists and many Washington spokesmen, is based upon the replies received from the executives of more than 2500 plants in the metalworking industries to questions asked by the editors of STEEL as to what industry expects in 1947. The plants from which returns were received are so diversified as to size, character of product and geographical location that the results can be assumed to reflect the opinion of the executive personnel of the entire metalworking industry.

It should be noted that this analysis is based upon the situation as it existed during the early part of November. It represents the thinking of industrialists at that time and therefore was not influenced by any repercussions of the coal strike. However, metalworking management had experienced similar work stoppages during 1946 and obviously took them into account in appraising prospects for 1947. According to their own reports, 91.9 per cent of all metalworking plants were affected in 1946 by material shortages, strikes or labor shortages. As a result of these obstacles, the metalworking industries in 1946 lost production valued at an estimated $19 billion and equal to the entire dollar volume for 1939.

With this experience in mind, executives would be expected to be extremely cautious in their predictions for 1947. Also, it must be remembered that the managers of industry are traditionally conservative in their forecasts. For instance, a year ago, when STEEL asked executives what they expected in 1946, their judgment was that production would exceed that of 1939 by 50.2 per cent. Actually, dollar volume of production in 1946 was approximately 122 per cent above that of 1939. In short, industry underestimated the potential of 1946 by a large margin.

In view of this corroboration of the habitual conservatism of industrialists, the optimistic outlook on prospects for 1947 takes on added significance. It is the consensus of executives in the metalworking industries that production in the new year will exceed that of 1946 by 27.5 per cent. This means an output valued at $55 billion,

ntHigher for 1947. . .

compared with $43 billion in 1946 and $19 billion in 1939. The executives envision employment in their industries in 1947 of 5,126,000 persons, compared with 4,429,000 in 1946 and 2,597,000 in 1939.

Metalworking plants expect to increase capacity in 1947 by 16.8 per cent over that of 1946 and an additional 5.8 per cent in 1948 and 1949. They also look for a definite trend toward two and three-shift operation instead of the single shift that prevailed in a majority of plants in 1946, a slight gain in worker productivity in 1947, increases of slightly less than 5 per cent in unit costs of manufacture and in sales and distribution costs, an increase of about 7 per cent in selling prices and a rather favorable over-all outlook for profits, although the percentage of profit to gross sales will be lower than in 1939.

Of particular interest is the attitude of management in regard to the compensation of employees. More than 42 per cent already have wage incentive, bonus or profit-sharing plans in effect and 31.6 per cent of the plants are considering the introduction of such programs. Although only a few metalworking plants have guaranteed annual wage systems in effect the number is more than expected and 14.7 per cent are considering the merits of such systems.

A large majority of plants are alert to methods of reducing costs and increasing output. Nearly 85 per cent of the plants will seek these objectives through the purchase of more modern production equipment, 78 per cent through the revamping of plant layout and improving the flow of work, 70 per cent through improved production controls, 67 per cent by the installation of materials handling equipment and 59 per cent through the redesign of products.

Great significance is found in the breakdown of returns by size of plant, nature of product and location. The smallest plants—those employing less than 50 persons—expect the largest percentage increase in employment in 1947. Manufacturers of machinery and transportation equipment have the brightest prospects for increased production in 1947 and in 1948-49, respectively. The Pacific Coast, the South and the Central West seem to be destined for the most rapid expansion of capacity in the short-term future percentagewise. However, the highly industrialized Midwest and East will show the most growth on a dollar volume basis.

On the whole, the report reflects a studied optimism on the part of executives in the metalworking industries which bespeaks a determination to make marked progress in the new year in spite of serious obstacles.

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Production Still Heads Upward

AMERICA'S metalworking industry, having tucked a record-breaking $43 billion peacetime volume under its belt in 1946, is confidently looking forward toward new high planes of production in the new year.

The record $43 billion figure represents an increase of 122 per cent over 1939 production of $19 billion as reported by the Bureau of the Census of the Department of Commerce.

New Peacetime Record Seen for 1947

This year, the metalworking industry reports to STEEL that it expects production will establish a still higher peacetime record of $55 billion, an increase of 27.5 per cent over 1946. In addition, the industry estimates that it could have produced nearly 45 per cent more in 1946 had it not been for strikes and material and labor shortages. The loss of $19 billion on a dollar volume basis is practically equal to the entire production for 1939, which was regarded as a pretty fair peacetime year.

Do these figures appear too optimistic? Traditionally, the metalworking industry has been conservative in its estimates of future output. In reporting on business prospects a year ago, the metalworking industry anticipated that production in 1946 would be only 50.2 per cent higher than in 1939, or $29 billion. Production data compiled by the Department of Commerce indicates that dollar volume of production last year was very closely in line with the $43 billion reported by the industry to STEEL.

Production figures of 1946 and 1947, expressed in dollar volume, admittedly reflect a considerable amount of inflation. Prices for metals and metal products advanced an average of 25 per cent between 1939 and 1946 and a further increase of 7 per cent over 1946 is expected in 1947. Thus, the increase on a dollar volume basis has been greater than the increase in unit volume. However, actual physical production of many metals and metal products last year reached a peacetime high.

Volume for 1939 Will Be Tripled

The $55 billion volume expected to be produced this year would be far above that achieved in any other peacetime year. It would be almost triple the dollar volume of 1939. It would exceed total annual national income from all sources from 1931 through 1934.

To the consuming public such a volume of output would mean the outpouring of an unprecedented amount of all kinds of metal goods, from bobby pins to new automobiles, from the smallest toys to huge locomotives and giant airplanes.

To the workers, it would mean an abundance of jobs.

To the government, it would mean rich revenues in the form of taxes.

To investors, it should mean fair profits.

Achievement of the anticipated volume of production would mean that for the first time, the vastly increased plant capacity of the metalworking industry, now two-thirds greater than before the war, would be making better things for better living at near capacity levels.

Allowance Made for Interruptions

Whether the expectations of the metalworking companies are realized depends on many factors. Primarily it depends on a substantial measure of management-labor peace. Widespread strikes and work stoppages could ruin the picture, as they marred it in 1946.

A recession for any cause or combination of causes would blight the highly favorable prospects.

Actually, metalworking is allowing for continued interruptions due to strikes and material shortages in 1947, although to a lesser degree than in 1946. Without these interruptions, it figures production in 1946 might have reached $62 billion. In anticipating 1947 production of $55 billion, the allowance for interruptions would appear to be $7 billion.

Three-fourths of all companies reporting expect to increase production this year over 1946. Only 6 per cent expect a decline. Twenty per cent foresee no change.

The industry is capable of producing this volume of

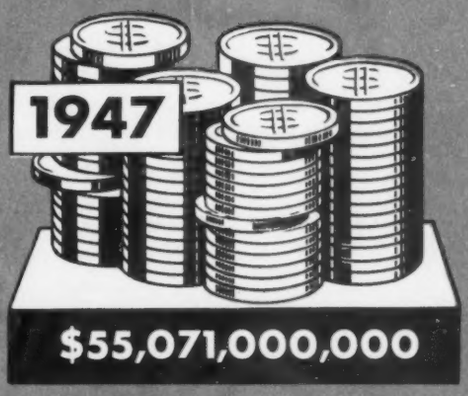
PRODUCTION

METALWORKING INDUSTRY

THE INCREASE IN PRODUCTION IN 1946 AS COMPARED TO 1939 WAS

122.0%

88.5% of All Plants Reported an Increase.
5.3% Reported No Change.
6.2% Reported a Decrease.



THE GAIN IN PRODUCTION IN 1947 OVER 1946 IS EXPECTED TO BE

27.5%

74.1% of All Plants Expect an Increase.
19.9% Expect No Change.
6.0% Expect a Decrease.

AVERAGE PRODUCTION INCREASE BY SIZE OF PLANTS

(000,000 OMITTED)

SIZE OF PLANT	ACTUAL 1939 PRODUCTION	ESTIMATED 1946 PRODUCTION	EXPECTED 1947 PRODUCTION	1946 INCREASE OVER '39	1947 INCREASE OVER '46
Less than 50 Employees	$ 1,709	$ 3,466	$ 4,423	102.8%	27.6%
50-100 Employees	1,224	2,706	3,401	121.1%	25.7%
100-500 Employees	5,305	11,491	14,272	116.6%	24.2%
500-1000 Employees	2,930	7,612	9,454	159.8%	24.2%
Over 1000 Employees	8,286	17,914	23,521	116.2%	31.3%
Total—Entire Industry	$19,455	$43,189	$55,071	122.0%	27.5%

goods. Plant capacity in 1946 was 68 per cent larger than in 1939. Further, it is anticipated that 1946 capacity will be expanded by nearly 17 per cent in 1947.

Prior to the coal strike late in 1946, metalworking companies were turning out goods at a rate of $4 billions a month. This level was reached in the face of shortages of materials and components resulting from the widespread strikes earlier in the year. Only a moderate expansion of the $4 billion monthly rate of production would be necessary to make 1947 a $55 billion year, in view of the 7 per cent increase in prices expected to prevail.

Early in 1946 the month-long steel strikes, the two-month coal strike, a shutdown in the electrical equipment industry and serious strikes in automotive plants, and hundreds of other work stoppages made it appear that 1946 would be a poor year. Despite numerous hinderances, it turned out to be an excellent year.

Some of the factors which restricted production in 1946 have disappeared. Chief among these are price controls, but many other government directives and regulations have disappeared or are on their way out. The economy virtually is free.

A new national labor policy that will establish better employer-employee relations appears to be in the formative stages. While this will by no means guarantee industrial peace, it will at least aid in assuring greater stability in industrial production.

$19 Billion in Production Lost

It is practically impossible to comprehend the tremendous amount of production lost in 1946 due to strikes and material and labor shortages.

However, it becomes easier to visualize this loss when it is realized the steel industry alone lost more than 13,000,000 tons in production of finished steel with a value of around $1 billion. If its value had been increased only ten times through fabrication into finished products, the loss would have been $10 billion. Actually, it was an estimated $19 billion, taking both primary metals and finished products into consideration.

Nearly 92 per cent of all metalworking companies reported output was reduced by strikes, material shortages or inability to obtain workers. Three-fourths were affected by strikes in their own or suppliers' plants. Eighty-five per cent said output was held down by lack of materials. More than half reported they could have produced more had the labor supply been adequate.

Most damaging blow to the industry was dealt by strikes in the plants of primary metal producers, especially in the steel industries. The nation-wide steel strikes starting in January and continuing for a month caused an acute shortage of steel in practically all consuming plants. Hardly had the mills resumed substantial operations when John L. Lewis led his coal miners out of the mines April 1 and again the steel mills shut down. The loss in steel production caused the shortage in steel products to continue acute throughout the year and slowdowns in consuming plants for want of steel were common.

Copper production was restricted by strikes throughout the early months of the year and this metal was rated the No. 1 critical material in hundreds of metalworking plants.

The shutdown of the big electrical equipment manufacturers caused a dearth of electric motors and other electrical components required before the products of thousands of manufacturers could be completely assembled and shipped to customers.

Hundreds of other work stoppages in the plants of parts suppliers hampered the operations of assembly lines in all metalworking plants throughout the year.

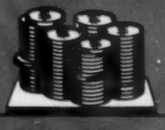
Although unemployment compensation payrolls were swollen throughout the year, many plants were unable to obtain sufficient labor. Partially this was due to liberal compensation, partially to the shortage of housing in areas where employment was available, partially to the lack of applicants with required skills and to similar causes.

Transportation Equipment Leads

All classifications of metalworking companies expect to make large gains in production this year.

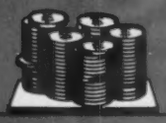
Most optimistic, however, are the manufacturers of transportation equipment who look for an average increase of 43.2 per cent over 1946. This would boost

INCREASES IN PRODUCTION
by Geographical Areas



	1946 INCREASE OVER '39	1947 INCREASE OVER '46
New England States	106.1%	17.5%
Middle Atlantic States	112.5%	25.0%
Southern States	98.4%	29.7%
Midwestern States	115.0%	25.5%
Central Western States	128.4%	31.5%
Pacific Coast	163.2%	27.2%
Net Increase—Entire U.S.	122.0%	27.5%

ANALYSIS OF PRODUCTION BY PRODUCT GROUPS



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	ACTUAL 1939 VOLUME	ESTIMATED 1946 VOLUME	EXPECTED 1947 VOLUME	1946 INCREASE OVER '39	1947 INCREASE OVER '46
Primary Metal Producers	$ 5,897	$11,316	$13,284	91.9%	17.4%
Fabricated Metal Products	3,411	7,126	8,672	108.9%	21.7%
Machinery	3,254	7,731	9,355	137.6%	21.0%
Electrical Equipment	1,962	5,139	6,747	166.8%	31.3%
Transportation Equipment	4,931	11,877	17,013	140.9%	43.2%
Total—Entire Industry	19,455	43,189	55,071	122.0%	27.5%

dollar volume of output for this group of manufacturers to more than $17 billion, or 345 per cent of 1939 output.

Included in the transportation group are the builders of automobiles, trucks and busses, motor vehicle parts and accessories, bodies, aircraft and aircraft parts, ships and railroad equipment.

The automotive industry last year was beset by more than its share of difficulties, particularly with strikes and shortages of materials and parts. Output for the year was only slightly above 3 million cars and trucks, or less than production for 1939 when 3,577,000 were made.

Failure of the automotive industry to achieve its production goals was perhaps the most outstanding single disappointment of the year.

Auto replacement parts manufacturers, although beset by the same type of difficulties that plagued the automakers, turned out a record volume of more than $1 billion in the first eight months of 1946.

Aircraft and aircraft parts production which zoomed to fantastic heights during the war, reaching 96,000 units in 1944, was faced with the necessity of shrinking back to peacetime size.

Shipbuilding, like aircraft, has become a peacetime casualty. No. 1 consumer of steel during the war years, it now has dropped back to about its prewar level and many of the giant shipyards built during the war now are engaged in shipbreaking or are lying idle.

Railroad equipment builders' production was limited only by the shortage of materials and availability of workers. Rolling stocks which bore a tremendous load during the war years are badly in need of replacement. In October, the Class I railroads had more than 60,000 freight cars and nearly 600 locomotives on order. During the first 10 months, 35,537 freight cars were placed in service. Since the close of the war, one manufacturer has received orders for more than $165 million for passenger cars alone.

Electrical Equipment Volume To Rise

Electrical equipment manufacturers, whose output last year was 167 per cent greater than 1939 output, expect a gain of 31.3 per cent in 1947. This would bring the year's volume to $6.7 billion, or more than triple 1939 output.

Production of electrical equipment was handicapped more by strikes and material shortages in 1946 than any other division of the metalworking industry. Ninety per cent of the electrical equipment manufacturers were affected by strikes and 97 per cent report output was limited by lack of sufficient materials. The acute copper shortage was especially serious to this industry. Silicon steel sheet and strip and iron castings also have been short.

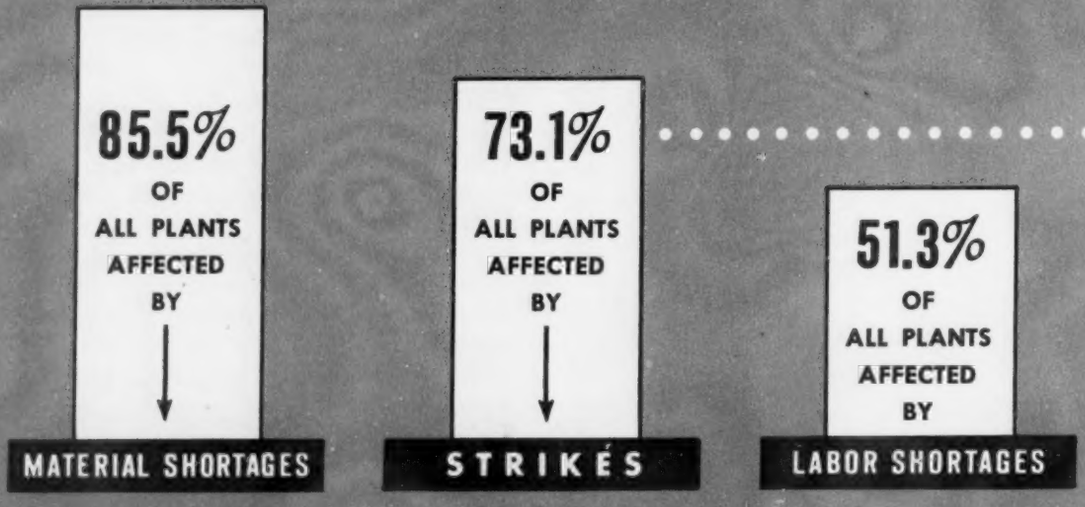
Had electrical equipment producers been able to obtain sufficient materials and labor and had not strikes closed down the bulk of the industry for a considerable period, they would have produced nearly 70 per cent more goods in 1946.

Backlogs for electric motors extends into 1948, despite large increases in capacity by established builders and the entry of a number of new companies into the field.

While the expansion in production and demand for motors stands out in the electrical equipment field, the same factors hold true for other types of electrical equipment. Generators, switchgear, switchboard apparatus, transformers, industrial equipment, communications equipment and instruments have shared in the increase. Makers of these items look for further gains this year.

$19 Billions in Production were Lost by the Metalworking Industry in 1946

PRODUCTION IN 91.9% OF ALL METALWORKING PLANTS WAS INTERRUPTED IN 1946 BY ONE OF THESE CAUSES



Machinery output (other than electrical) in 1946 was valued at $7.7 billion, an increase of nearly 138 per cent over 1939. Manufacturers of this type of equipment expect to increase dollar volume by 21 per cent this year to a total of more than $9 billion. This Bureau of the Census classification includes machine tools and accessories, agricultural machinery, construction and mining machinery, materials handling equipment, power transmissions, engines and turbines, office and household machines and appliances, pumps and compressors, and miscellaneous machinery.

Machinery manufacturers estimate they could have produced 38.7 per cent more goods last year if strikes, material and labor shortages had not limited output.

$8.7 Billion for Fabricated Metals

Plants whose products cover a wide range from fabricated structural steel down to toys and light metal specialties, look forward to increasing dollar volume by 21.7 per cent this year to a total of $8.7 billion. These plants last year turned out a total of $7.1 billion, an increase of 108.9 per cent over 1939. Strikes, material and labor shortages prevented their 1946 volume from being almost 50 per cent greater than it was.

Within the fabricators' group, producers of equipment for housing facilities, such as plumbers' supplies, metal doors, sash, frames, molding and trim, and lighting fixtures are assured of heavy demand throughout 1947.

More Primary Metal Business

Plants in the primary metal group, including blast furnaces, steelworks and rolling mills, iron and steel foundries, nonferrous smelters, refiners and rolling mills, nonferrous foundries, and iron and steel forging shops, anticipate a 1947 volume 17.4 per cent greater than 1946. This would result in dollar volume of $13.3 billion. Last year, primary metal producers' output amounted to $11.3, a gain of 91.9 per cent over 1939.

Had it not been for strikes, material and labor shortages, these producers last year would have produced about $14.7 billion worth of goods, 30.8 per cent more than actual 1946 output.

The basic steel industry's loss in production can be pinned directly on strikes—in the steel industry itself and in the coal industry to which reference was made earlier.

No. 1 material shortage was in scrap.

Shortages of scrap and of pig iron limited output of iron and steel foundries. Channeling of pig iron into the housing program intensified an already tight situation. Foundries also experienced difficulty in obtaining workers.

Copper production was seriously disrupted by strikes during the first half of the year. Settlement of these was delayed by government wage and price controls, and the loss in copper production was felt in many metalworking plants.

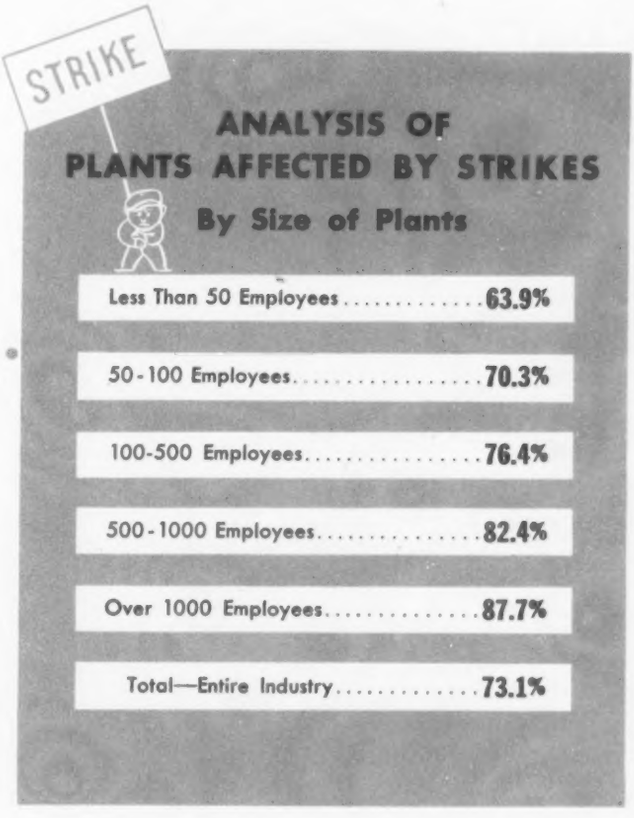
Big Plants Expect Greatest Gains

Expectations for large increases in production this year are greater among plants employing 1000 or more workers. These companies expect to increase output by 31.3 per cent, compared with 27.5 per cent for the entire industry. Plants employing more than 1000 workers expect to produce $23.5 billion out of the industry total of $55 billion.

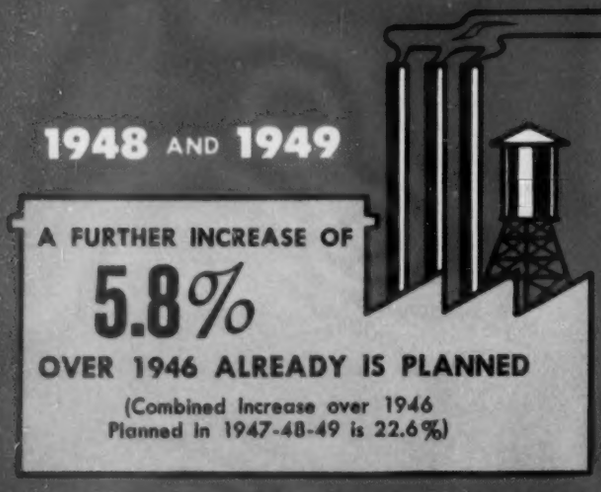
The greatest relative increases in production from 1939 to 1946 were made by the medium size plants employing from 500 to 1000, reporting an increase of 159.8 per cent compared with 116 per cent for plants employing more than 1000.

Production Picture Startling

Adding up the whole story of metalworking production in its first full peacetime year gives a startling picture of the real potentials of this, the world's largest industry. Despite what may accurately be termed all hell and high water, production rose to the tremendous total of $43 billion and given half a break this year will continue to climb to almost three times that of 1939.



PLANT CAPACITY



Metalworking P

DESPITE the enormous amount of additional plant capacity built by the metalworking industry with its own funds and those of the U. S. government during the war, it feels that still more capacity will be required to keep pace with demand for its products.

It already has been shown that dollar-volume of production in 1946 was 122 per cent higher than in 1939. This production, despite interruptions, was carried out in plants with capacity which had been expanded by 68.1 per cent. Part of the government-built capacity, of course, is not suitable for production of civilian goods, partially because of the type of construction and because of poor location geographically.

Capacity To Be Increased 22.6% in 3 Years

For the reason that it apparently finds its facilities inadequate and expects to increase production further, the metalworking industry already has plans for increasing capacity 16.8 per cent in 1947 as compared with 1946 plus an additional 5.8 per cent already planned in 1948 and 1949.

During the past year, many companies have faced the perplexing problem of whether to go ahead with plant expansion programs projected for the next two or three years. On one hand, it was believed that an expanded potential market existed for both consumer and capital goods which probably would hold up well for the next several years. On the other hand, doubt was expressed as to whether materials and skilled labor would be available in sufficient quantity to assure a

ANALYSES OF EXPANDED PLAN

BY LOCATION:	1946 INCREASE OVER '39	1947 INCREASE OVER '46	1948-49 INCREASE OVER '46
New England States	62.0%	10.5%	3.2%
Middle Atlantic States	66.7%	18.4%	5.1%
Southern States	69.8%	14.3%	3.6%
Midwestern States	70.8%	15.7%	6.2%
Central Western States	71.0%	16.5%	4.2%
Pacific Coast	99.0%	20.8%	9.4%
Total—Entire U.S.	68.1%	16.8%	5.8%

Plants Plan More Capacity

reasonable rate of operations at a fair profit.

While some of these expansion plans have been held in abeyance, a substantial segment of the metalworking industry has demonstrated its willingness to go ahead on the basis that the material supply situation will ease somewhat this year as bottlenecks in production are erased. The opinion also has been expressed that the labor supply has not been entirely absorbed and that productivity of labor, generally speaking, is likely to improve.

Small Plants To Show Most Percentage Gain

An examination of the detailed figures for plants of various size reveals that a proportionately larger expansion in capacities during the past seven years took place among the plants employing 500 workers and upwards. This was not surprising in view of the many facilities set up during the war to mass-produce essential war items. And yet it cannot be overlooked that the smaller plants also registered substantial growth.

Superficial surveyal of the figures on plant expansion by the five principal divisions of the metalworking industry would tend to indicate that producers of primary metals and components, such as forgings and castings, are not adding facilities to match those of metal consuming plants.

Actually, it has not been necessary for the steel industry, for example, to expand capacity at the same percentage rate as steel consuming plants. This is because there has been a strong trend in recent years toward the use of steels in lighter sections, made possible by the development of stronger alloys and through improvements in product designs and in fabricating methods. This means that a ton of ingots will go farther than it did 20 years ago. Steel ingot capacity, however, also has been increased 10,000,000 tons since 1939 to about 92,000,000 tons.

Expansion of fabricating plant capacity very often requires the addition of floor space for the installation of more production machines and assembly lines.

Capacity for production of the light metals, aluminum and magnesium, was increased tremendously during the war. Extensive brass mill facilities also were added, especially for the production of sheet and strip.

Fewer Companies Seek Government Plants

Fewer than 4 per cent of the metalworking companies are planning to purchase government-owned plant capacity this year. This is in marked contrast to the interest in government-owned equipment reported to STEEL a year ago.

This may be explained by the fact that much of the more desirable surplus capacity has been absorbed by the industry during the past year.

Chief interest in government plants is indicated by the largest size companies. Nearly 16 per cent of those employing more than 1000 are planning to buy such capacity Nearly 7 per cent of those employing between 500 and 1000 are planning to buy government plants. Interest of the smaller size plants is negligible.

APACITIES BY LOCATION, SIZE OF PLANT AND PRODUCT GROUPS

BY PLANT SIZE:	1946 INCREASE OVER '39	1947 INCREASE OVER '46	1948-49 INCREASE OVER '46
Less than 50 Employees	49.1%	18.8%	5.3%
50-100 Employees	73.7%	19.8%	6.4%
100-500 Employees	69.2%	15.8%	5.5%
500-1000 Employees	92.1%	13.3%	3.8%
Over 1000 Employees	81.8%	18.0%	4.0%
Total—Entire Industry	68.1%	16.8%	5.8%

BY PRODUCTS:	1946 INCREASE OVER '39	1947 INCREASE OVER '46	1948-49 INCREASE OVER '46
Primary Metal Producers	38.3%	13.9%	4.4%
Fabricated Metal Products	65.7%	18.4%	1.4%
Machinery	80.2%	26.9%	6.0%
Electrical Equipment	92.8%	23.5%	6.3%
Transportation Equipment	75.3%	24.1%	8.9%
Total—Entire Industry	68.1%	16.8%	5.8%

More Workers Will Be Employed

METALWORKING plants will continue to expand their payrolls in 1947 in order to get out 27.5 per cent more production than in 1946. Nearly 700,000 more workers will be required, an increase of 15.7 per cent over 1946. This indicates total employment in the metalworking industry will be 5,126,000, approximately double the number employed in 1939.

The trend will be toward more multiple shifts. Many plants now working one shift expect to move up to two and plants now working two shifts expect to add a third.

1946 Work-Week Averaged 43.8 Hours

The average work-week will be shorter than the 43.8-hour average of 1946. This will result from efforts to reduce payments for overtime work, from addition of more shifts and from general regularization of employment.

Overtime work will be reduced by half of all metalworking plants in order to cut costs.

Labor supply, especially in the skilled classifications, will continue tight. Reservoir of unemployment currently is only 2 million and comprises largely unskilled workers. No abnormal increase to the labor force is expected in 1947 and one out of every five plants believes it will be unable to obtain the additional help needed.

Job training programs will be expanded in nearly half the metalworking plants in an effort to develop more skilled workers.

Worker productivity, now 10.5 per cent below 1939, is tending up slightly in many plants although the experience of individual companies varies considerably.

Wage incentive, bonus or profit-sharing plans are being carried out by two-fifths of the industry. Many others are considering installation of such plans.

Guaranteed annual wage plans, now on the agendas of the major unions in the metalworking field, have been adopted by few companies. About 15 per cent of the plants, however, say they are thinking about such programs.

Working Forces To Be Increased

Metalworking companies expect to add 697,000 employees to payrolls this year, raising the industry's total to 5,126,000. This will be virtually double the 1939 employment of 2,597,000, and represents an increase of 15.7 per cent over the 1946 employment of 4,429,000.

Based on the assumption that a reasonable measure of industrial peace will prevail in 1947, the metalworking industry stands ready to fulfill or exceed its obligations toward full employment.

The industry more than fulfilled these obligations during 1946, despite widespread interruptions by strikes and other work stoppages, and exceeded even its own expectations in providing employment. A year ago the metalworking industry reported to STEEL it expected to provide employment for 3,650,000 workers during 1946. Today, the figures show the industry actually employed 4,429,000, or 21 per cent more than anticipated at that time.

Overall civilian employment during 1946 was around 58 million, or about 4 million more than estimated necessary for "full employment" by the Committee for Economic Development. The unemployment float currently is only about 2 million.

The largest expansions in hirings this year are expected by transportation equipment manufacturers, who foresee a 23.2 per cent increase in number of employees, and by the electrical machinery and equipment manufacturers, who anticipate an increase of 22 per cent. Producers of fabricated metal products look for an increase of 17 per cent, machinery manufacturers for an advance of 11.5 per cent and primary metals producers for a raise of 6.9 per cent.

More Shifts To Be Added

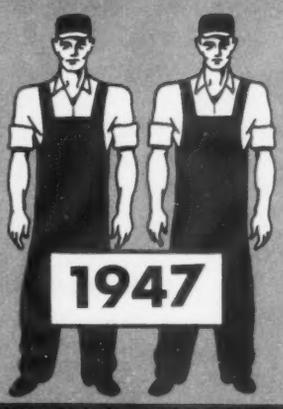
Seven of every ten metalworking companies, whose operations are such that they can profitably work more than one shift, plan to operate on either a two or three-shift basis in 1947. Last year, only six of ten such plants operated more than one shift.

Study of the accompanying chart and table reveals

EMPLOYMENT

2,597,000 WORKERS

4,429,000 WORKERS



5,126,000 WORKERS

METALWORKING INDUSTRY

THE INCREASE IN EMPLOYMENT IN 1946 AS COMPARED TO 1939 WAS

70.5%

73.8% of All Plants Reported an Increase.
13.3% Reported No Change.
12.9% Reported a Decrease.

THE GAIN IN EMPLOYMENT IN 1947 OVER 1946 IS EXPECTED TO BE

15.7%

56.4% of All Plants Expect an Increase.
38.4% Expect No Change.
5.2% Expect a Decrease.

AVERAGE EMPLOYMENT INCREASE BY SIZE OF PLANTS

SIZE OF PLANT	ACTUAL 1939 EMPLOYMENT	ESTIMATED 1946 EMPLOYMENT	EXPECTED 1947 EMPLOYMENT	1946 INCREASE OVER '39	1947 INCREASE OVER '46
Less than 50 Employees	265,000	392,000	466,000	47.9%	18.7%
50-100 Employees	189,000	309,000	349,000	63.7%	13.1%
100-500 Employees	736,000	1,144,000	1,317,000	55.4%	15.1%
500-1000 Employees	363,000	713,000	806,000	96.5%	13.0%
Over 1000 Employees	1,044,000	1,871,000	2,188,000	79.2%	16.9%
Total—Entire Industry	2,597,000	4,429,000	5,126,000	70.5%	15.7%

that the trend toward more shifts will take place among all sizes of plants although it is accentuated more in the case of the large plants. As might be expected, nine of ten of the plants employing 1000 or more workers will be on a multiple shift basis in 1947. Less than one-half of the small plants with less than 50 employees will work more than one shift.

Shifts Cut Investment per Worker

Chief advantages of multiple shift operation are the spreading of the cost of capital investment per worker. With $6000-$7000 required in facilities for every worker in the metalworking industries, the savings resulting from two or three-shift operation over single shift are obvious.

On the other hand, two or three shifts necessitate the spreading of supervisory personnel more thinly and this works a hardship for many companies. It may contribute to less efficiency on the second and third shifts.

Most workers prefer to work on day shifts, despite the frequent premium payments for working the later shifts. Generally, this results in the older more experienced workers gravitating to the day shifts, leaving the later ones to be manned by less experienced workers.

Three-shift operations are more common with primary metal producers than with other product groups. This arises from the necessity for continuous operations in many processes. More plants in this group will operate round the clock this year than in the metal consuming industries.

In the fabricated metal products, machinery, electrical machinery and equipment, transportation equipment and instrument groups, a majority of companies prefer the two-shift plan.

Work-Week Not Cut Back to 40 Hours

When the labor unions launched their first postwar drive for wage increases in the fall of 1945 it was based almost entirely on the plea of maintaining wartime take-home pay. The unions argued—effectively if not truly—that with the end of the war the work week would be cut back to 40 hours from a wartime 48 hours. The loss to the wage earner, the unions contended, would be equivalent to 12 hours' pay a week and a 30 per cent increase in wage rates would be necessary to maintain the same weekly wage that they drew during the war.

Last year's experience demonstrated the fallacy of this contention. The work-week in all metalworking plants, which did not actually reach an average of 48 hours during the war, averaged 43.8 hours during 1946, calling for a substantial amount of overtime pay for workers.

Average hours worked per week were well above the standard 40 in all sizes of plants, in those operating multiple shifts as well as those operating on single shifts.

For those plants operating only one shift and which find it impracticable to go to multiple shifts the average work-week was 43.9 hours. Those operating two shifts averaged 43.5 hours and those on three shifts averaged 41.8 hours.

Primary metal producers averaged 43.2 hours; fabricated metal products, 43.9 hours; machinery builders, 44.7 hours; electrical machinery and equipment plants 43.3 hours and transportation equipment plants 42.6 hours.

Overtime Work Will Be Reduced

More than half the metalworking companies will seek to reduce the amount of overtime work in 1947. Large plants are looking to this means of cutting costs more than the smaller plants, as already indicated by the figures on more multiple shift operations. Seven of ten plants employing more than 1000 and six of ten plants employing between 500 and 1000 expect to shorten their work-weeks, compared with only 46.8 per cent of the plants employing less than 50.

Extra hours will be reduced by 65.6 per cent of the primary metals producers and by 64.7 per cent of the transportation equipment manufacturers. Only 39.3 per cent of electrical equipment plants expect to cut premium hours; 49.8 per cent of the machinery builders and 51.4 per cent of the makers of fabricated metal products.

One-fifth of the plants expect they will be unable

INCREASES IN EMPLOYMENT
by Geographical Areas

	1946 INCREASE OVER '39	1947 INCREASE OVER '46
New England States	56.8%	8.4%
Middle Atlantic States	72.9%	16.4%
Southern States	48.4%	22.2%
Midwestern States	68.2%	15.0%
Central Western States	107.2%	21.7%
Pacific Coast	101.7%	15.8%
Net Increase—Entire U.S.	70.5%	15.7%

ANALYSIS OF EMPLOYMENT BY PRODUCT GROUPS

	ACTUAL NO. 1939 WORKERS	ESTIMATED 1946 WORKERS	EXPECTED 1947 WORKERS	1946 INCREASE OVER '39	1947 INCREASE OVER '46
Primary Metal Producers	645,000	968,000	1,035,000	50.0%	6.9%
Fabricated Metal Products	584,000	903,000	1,057,000	54.6%	17.0%
Machinery	523,000	960,000	1,071,000	83.5%	11.5%
Electrical Equipment	289,000	572,000	698,000	97.9%	22.0%
Transportation	556,000	1,026,000	1,265,000	84.5%	23.2%
Total—Entire Industry	2,597,000	4,429,000	5,126,000	70.5%	15.7%

to hire the additional labor needed in 1947. This expectation is shared by plants of all sizes.

Primary metal producers anticipate more difficulty in obtaining additional workers than do plants in other divisions of the metalworking industry. Three of ten plants say they will not be able to hire all the men they need, which undoubtedly reflects to a considerable extent difficulties encountered by foundries.

Tight Labor Market Is Seen

A tight labor market throughout this year is indicated by employment figures. Currently, only about 2 million members of the labor force are unemployed. No abnormal increases to the civilian labor force of production workers is expected this year and releases from the armed services will be small compared with those of 1946.

A considerable number of white collar workers will be released by government war agencies and a few of these may seek employment in production jobs, but the bulk will attempt to obtain clerical positions. Some veterans now enrolled in educational institutions under the G. I. bill may soon become available to the labor force.

Skilled male labor is in acute short supply in most production centers now. Technical workers and semi-skilled men also are scarce while the supply of unskilled labor is reported adequate in most areas.

The total labor force, including the armed services, has shrunk by about 4 million since the war ended. This results primarily from women workers returning to their homes, over-age workers returning to retirement and youths returning to school. Thus the total labor force at present is about 62 million, of which slightly less than 60 million constitute the civilian labor force. Of the latter, about 58 million are employed, and barely more than 2 million are unemployed.

Figures on the total size of the labor force and on the number of unemployed are, of course, somewhat flexible. The figures on employed persons include those who have a job but are not working due to illness, vacation, labor dispute or temporary layoffs.

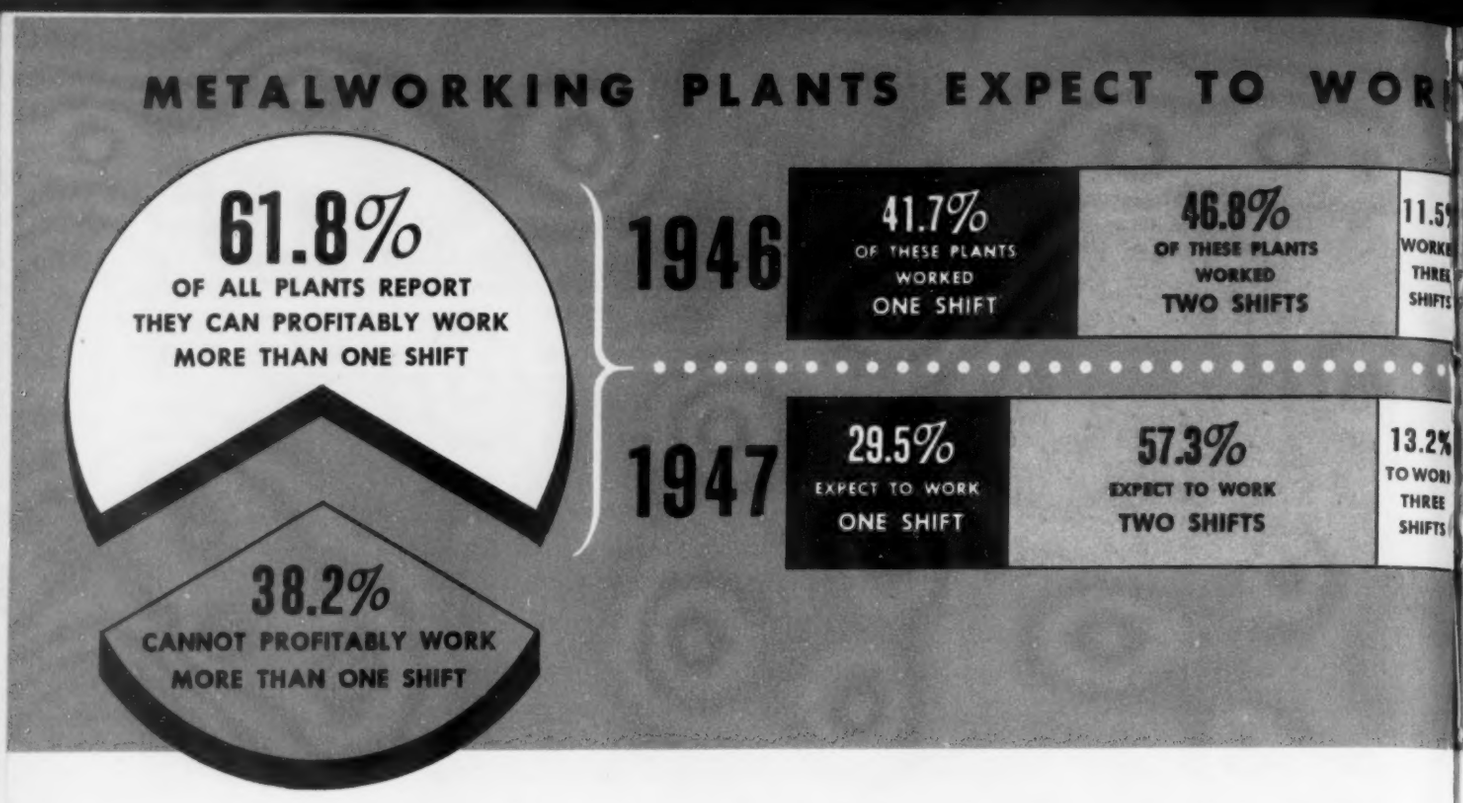
A number of plants reported to STEEL that full utilization of potential labor is being restricted by liberal unemployment compensation, which is encouraging men to resist employment, and by housing shortages, which are restricting migration to areas where labor is needed.

In some instances the scarcity of skilled workers is blamed on union policies restricting admittance of trainees.

Job Training To Be Expanded

Nearly half of all metalworking plants will expand their job training programs or install new training systems to improve the skills of old as well as new employees. Examination of the accompanying table reveals a wide difference in planning among plants of various size which is not at all surprising. In the small plants employing less than 50 workers, only a third will expand their training programs compared with over 73 per cent of the large plants with over 1000 workers. Small plants often do not require training programs, as such, since new men coming in attain their skills by working along side veteran employees. This type of training is less practicable in large plants where the turnover often is greater and new employees may be more easily indoctrinated through class-type training.

The electrical equipment, machinery and transportation equipment industries, which will account for a larger share of the increase in employment this year



than other groups, also will expand their job training programs proportionately.

Worker Productivity Down

It has been generally conceded that worker productivity is down considerably. Part of this is due to an apathetic attitude on the part of labor engendered by union leaders, part to numerous changes in jobs coincidental with reconversion to peacetime operations but, to give the individual worker proper credit, it also is due to the uneven flow in incoming materials. Many a production line has jerked to a halt for minutes and even hours because materials or parts could not be delivered to the right spot in the plant at the right time.

It has been the opinion in some quarters that worker productivity is off 35 per cent and this figure has been, and still is representative for many plants. However, the metalworking industry as a whole reports that productivity is down only 10.5 per cent as compared with 1939. And, as indicated in the chart, 37 per cent of all plants report either an improvement in productivity or no change since 1939.

Declines in productivity were most marked in the larger plants employing more than 1000 workers. The smallest declines were reported by the small plants, those employing less than 50, but even in this group, nearly six of ten companies reported productivity is down.

A substantial number of companies report that the bottom has been reached in the decline of productivity and that the present trend is upward. One-third of all companies report an upward trend, against 26.4 per cent which find the trend still is downward. Two of five companies can discern no trend in either direction at present.

Significantly, the greatest reversal in the downtrend in productivity is reported by the large companies with over 1000 workers. In this group, 75 per cent report productivity is 18.3 per cent lower than in 1939. However, 63.4 per cent also report that the present trend is upward.

Factors causing productivity to rise or fall are found to be diversified. Better production methods, wage incentives, improved morale and modern machinery contributed to improved output per man-hour.

Wage Incentive Plans Gain Favor

Reduced productivity despite sharp increases in hourly wage rates is causing management to cast about for means to control unit labor costs. One remedy for the problem appears to be the installation of incentive plans which reward increased production with more dollars in the pay envelope.

More than 40 per cent of metalworking companies now have incentive, bonus or profit-sharing plans in operation and another 30 per cent are considering the installation of such programs.

More large plants look to incentive plans to obtain higher productivity than do small plants. Nearly 70 per cent of the companies employing more than 1000 are using incentive programs, compared with less than 30 per cent of the small plants. Operators of the smaller plants explain that top management are in closer contact with workers and that individual rates of employees can be set more equitably than in larger plants where contact between management and worker is more remote. Nevertheless, more than one-third of the smallest plants are considering installation of incentive plans.

It is extremely significant that companies with wage incentive, bonus or profit-sharing plans report higher productivity than plants on a straight hourly rate basis.

MORE MULTIPLE SHIFTS IN 1947...

ANALYSIS BY SIZE OF PLANTS	ONE SHIFT		TWO SHIFTS		THREE SHIFTS	
	1946	1947	1946	1947	1946	1947
Less than 50 Employees	75.8%	53.5%	20.6%	42.9%	3.6%	3.6%
50-100 Employees	50.9%	39.5%	43.8%	54.1%	5.3%	6.4%
100-500 Employees	36.0%	23.7%	53.1%	63.5%	10.9%	12.8%
500-1000 Employees	17.1%	13.5%	57.8%	58.1%	25.1%	28.4%
Over 1000 Employees	15.5%	9.1%	54.5%	58.4%	30.0%	32.5%
Average	41.7%	29.5%	46.8%	57.3%	11.5%	13.2%

Twenty per cent of the companies paying extra for above-standard production report worker productivity in 1946 was higher than in 1939. Only 7 per cent of the straight-rate plants report an increase.

Similarly, 70 per cent of plants without wage incentives or bonus plans report a decline in productivity from 1939 to 1946 while only 56 per cent of plants with wage incentives suffered a decline.

Present trend of productivity is upward in more plants operating under incentive programs. Thirty-eight per cent of incentive plants say the present trend is upward against 28 per cent in plants on a straight-rate basis.

Productivity Aided by Incentives

The net average decline in productivity, from 1939 to 1946, was 13.3 per cent in plants operating on a straight-rate basis, against only 7.3 per cent for companies with incentive plans. Average decline for all companies was 10.5 per cent.

That a substantial portion of companies are thinking about installing incentive plans indicates 1947 and the years following may see a marked increase in such programs. One obstacle of the past and present to installing such plans has been the objections of labor unions. Reasons given by labor leaders to justify their opposition to incentive plans have been many and varied, and an analysis of the objections reveals no homogeneity in their thinking.

One of the most widely expressed objections by organized labor to incentive plans is the fear that increased productivity may mean fewer jobs. Since the beginning of the war this argument has lost much of its force because of the general shortage of manpower. It will reappear as soon as unemployment increases. The counter argument that higher productivity eventually will make more jobs and better living falls on deaf ears among most workers.

Another objection advanced by labor is that incentive plans may be used to support a low level of basic pay, but the air has been taken out of this one by the sharp advances in straight hourly rates throughout all industry.

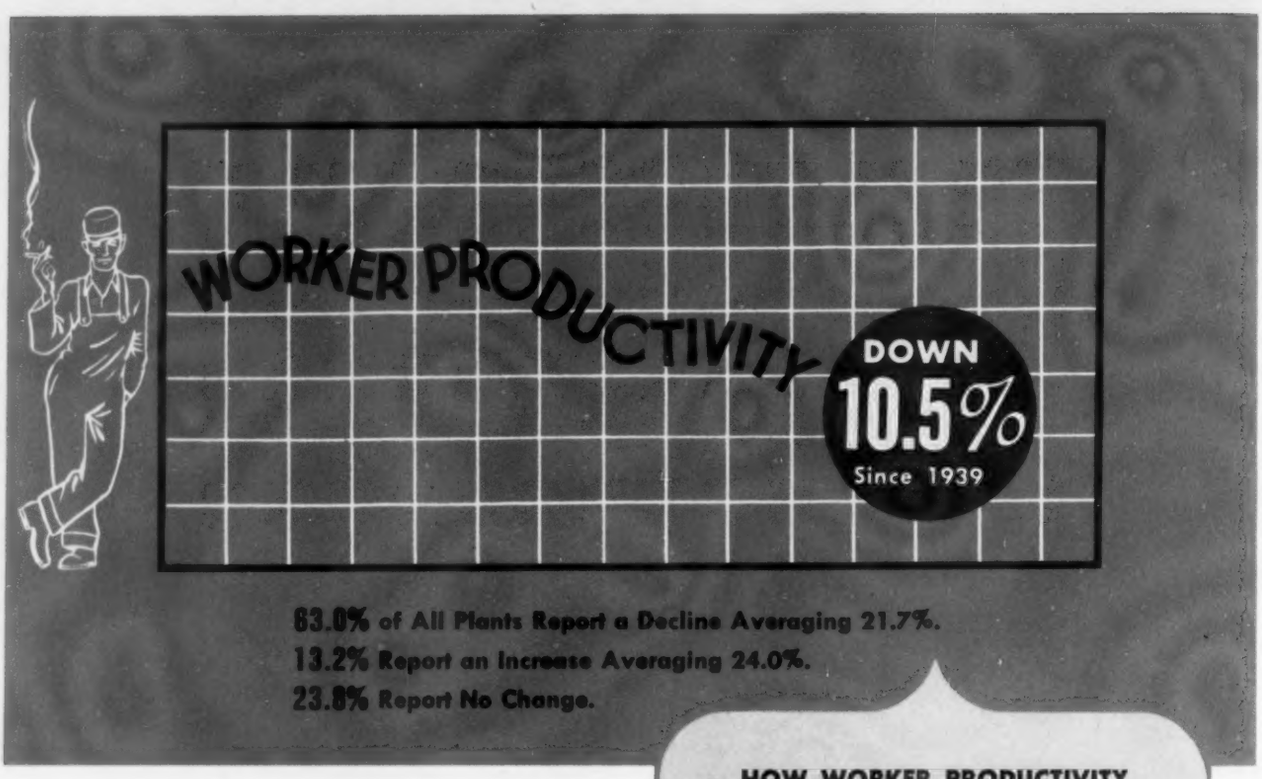
A basic, although seldom expressed, objection of union leaders is that under an incentive plan the in-

OVERTIME WORK

52.5%

OF ALL METALWORKING PLANTS PLAN TO REDUCE OVERTIME WORK

Analysis by Size of Plants	PLAN TO REDUCE OVERTIME
Less than 50 Employees	46.8%
50-100 Employees	53.6%
100-500 Employees	50.4%
500-1000 Employees	60.8%
Over 1000 Employees	72.9%
Average—Entire Industry	52.5%



dividual worker controls the amount of wages he receives and therefore has little need for the union.

More legitimate objections are based on past abuses of incentive systems and upon instances of unfairness, inequities and complexities of plans in operation. Most of these can be eliminated by careful engineering of incentive plans.

A considerable amount of data and experience with plans making pay proportional to accomplishment is now available to management wishing to install such programs.

Some mellowing in the attitude of the unions toward incentive plans also is noted and it is possible that incentive programs may become an acceptable substitute for straight rate increases.

HOW WORKER PRODUCTIVITY HAS DECLINED GEOGRAPHICALLY

	DECLINE
New England States	10.2%
Middle Atlantic States	8.3%
Southern States	8.6%
Midwestern States	10.9%
Central Western States	4.3%
Pacific Coast	13.9%
Net Decline—Entire U.S.	10.5%

Few Have Annual Wage Plans

Only 2.2 per cent of metalworking plants now have guaranteed annual wage plans but even this low figure is higher than generally expected; 14.7 per cent are thinking about such plans. It is noted that a large portion of those reporting guaranteed wage plans in operation are in the smaller size plant groups. Only about one-half of one per cent of all manufacturing employees are covered by guaranteed wage plans.

While most guaranteed annual wage plans in operation were installed as result of management initiative, the major unions now are demanding that some such guarantee be incorporated in wage contracts. The annual wage promises to become a top-drawer issue in management-labor negotiations over the next several years.

Experience with guaranteed wage plans has been limited. A number of those installed by company managements have failed and have been abandoned. Among the causes given for dropping of the plans are: Union activity and attitude; wartime conditions; depression of the 1930s; adoption of the Social Security Act; and employee indifference.

Annual Wage Studies Under Way

The plans which have been tried and abandoned and those which have survived recently have been undergoing careful analysis as various economic research groups have made studies of the annual wage problem. Among major studies made recently or under way are those by the National Industrial Conference Board, which has surveyed the question several times

over the past nine years, the Brookings Institution, and the Office of War Mobilization & Reconversion. The latter study developed directly from the demand for a guaranteed annual wage by the United Steelworkers of America.

An interim report made by the OWMR held that wage guarantees can be made by industry without increasing costs to employers by more than 6 per cent, if co-ordinated with the existing system of state unemployment compensation.

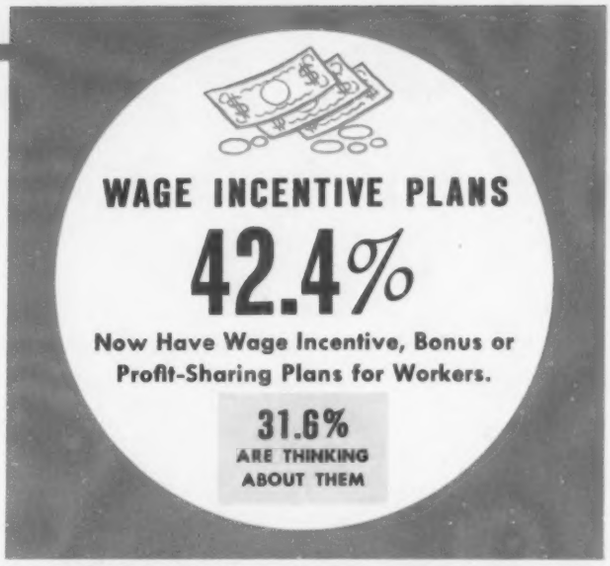
The report suggested the federal and state governments should broaden the present unemployment compensation benefits and extend special tax exemptions to encourage more widespread acceptance of the guaranteed wage plan.

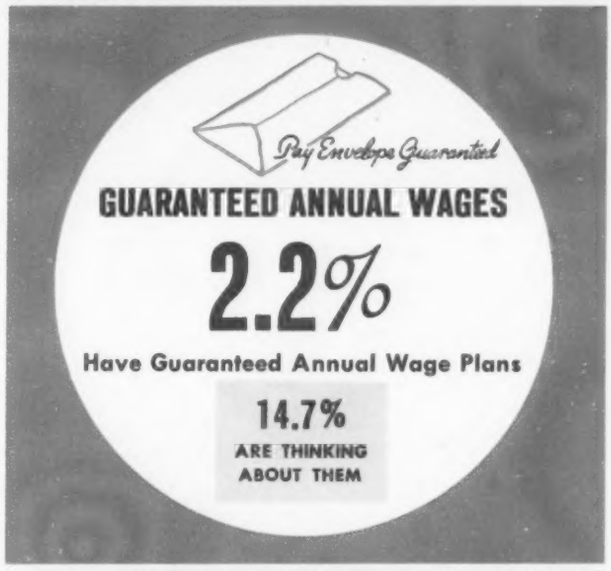
Murray W. Latimer, former chairman of the National Railroad Retirement Board and director of the OWMR study, says the guaranteed wage is not a panacea for the insecurity of the economic system and that it cannot in itself eliminate the fluctuations which have been characteristic of that system. On the other hand, he says, "It is quite clear that widespread wage guarantees can be made a substantial contribution to the stabilization of the economy through the stabilization of wage earner income and hence of consumer expenditures."

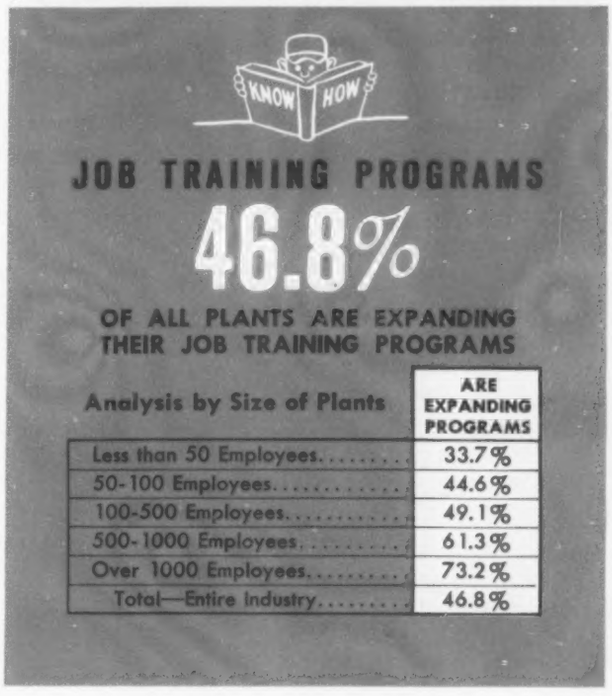
A companion study which will evaluate the "overall economic influence" of guaranteed annual wage plans is being completed for the OWMR by Professors Alvin H. Hansen of Harvard University, former economic adviser to the Federal Reserve Board, and Paul A. Samuelson of Massachusetts Institute of Technology.

Most industrialists feel about annual wage plans as they feel about the abolishment of cancer or tuberculosis; the ends to be gained are exceedingly desirable but immediate or even early attainment appears wellnigh impossible.

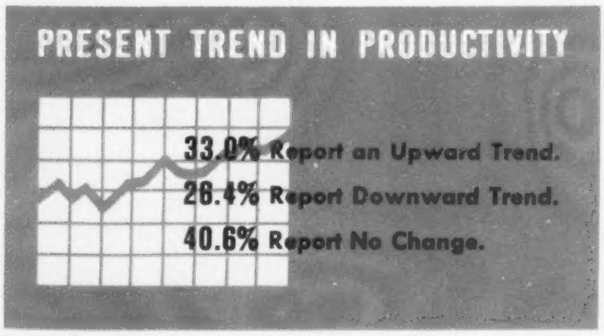
The No. 1 prerequisite of a guaranteed annual wage as well as its objective is the stabilization of production. It still is lunch table conversation as to which is the horse and which is the cart.





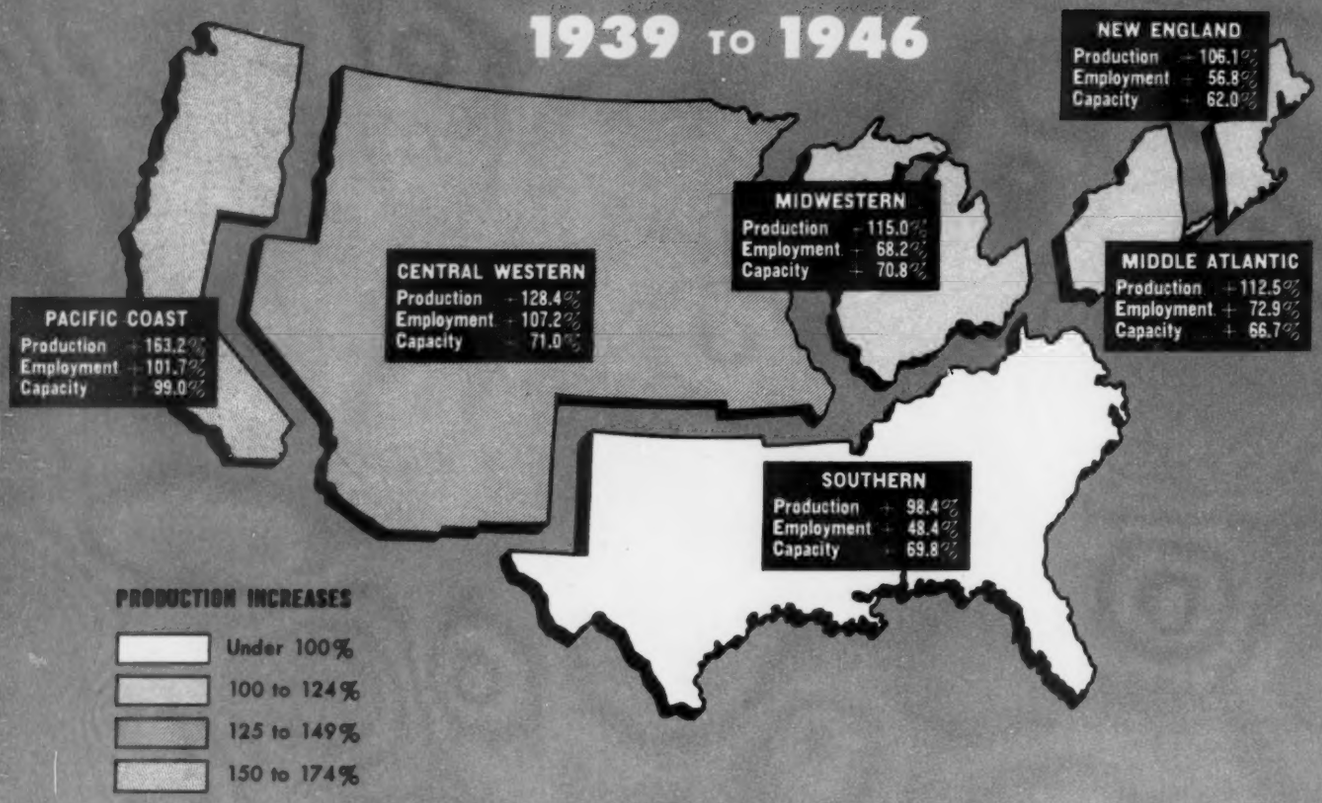


Analysis by Size of Plants	ARE EXPANDING PROGRAMS
Less than 50 Employees	33.7%
50-100 Employees	44.6%
100-500 Employees	49.1%
500-1000 Employees	61.3%
Over 1000 Employees	73.2%
Total—Entire Industry	46.8%



GEOGRAPHICAL SHIFTS in Pr

1939 TO 1946



ON THE BASIS of percentage increases in production, employment and plant capacity between 1939 and 1946 and anticipated increases during the current year as compared with 1946, a further slight shift in the metalworking industry toward the West is apparent.

As will be noted by referring to the above illustrations, the three Pacific Coast States outstripped all other areas from the standpoint of percentage increases in production and plant capacity between 1939 and 1946 and were second only to the Central Western States in gains in employment.

Pacific Coast To Add Capacity

In the current year, metalworking plants in these three western states expect to increase plant capacity by a larger percentage than any other area. Percentage increases are almost twice those anticipated for both employment and capacity by New England plants.

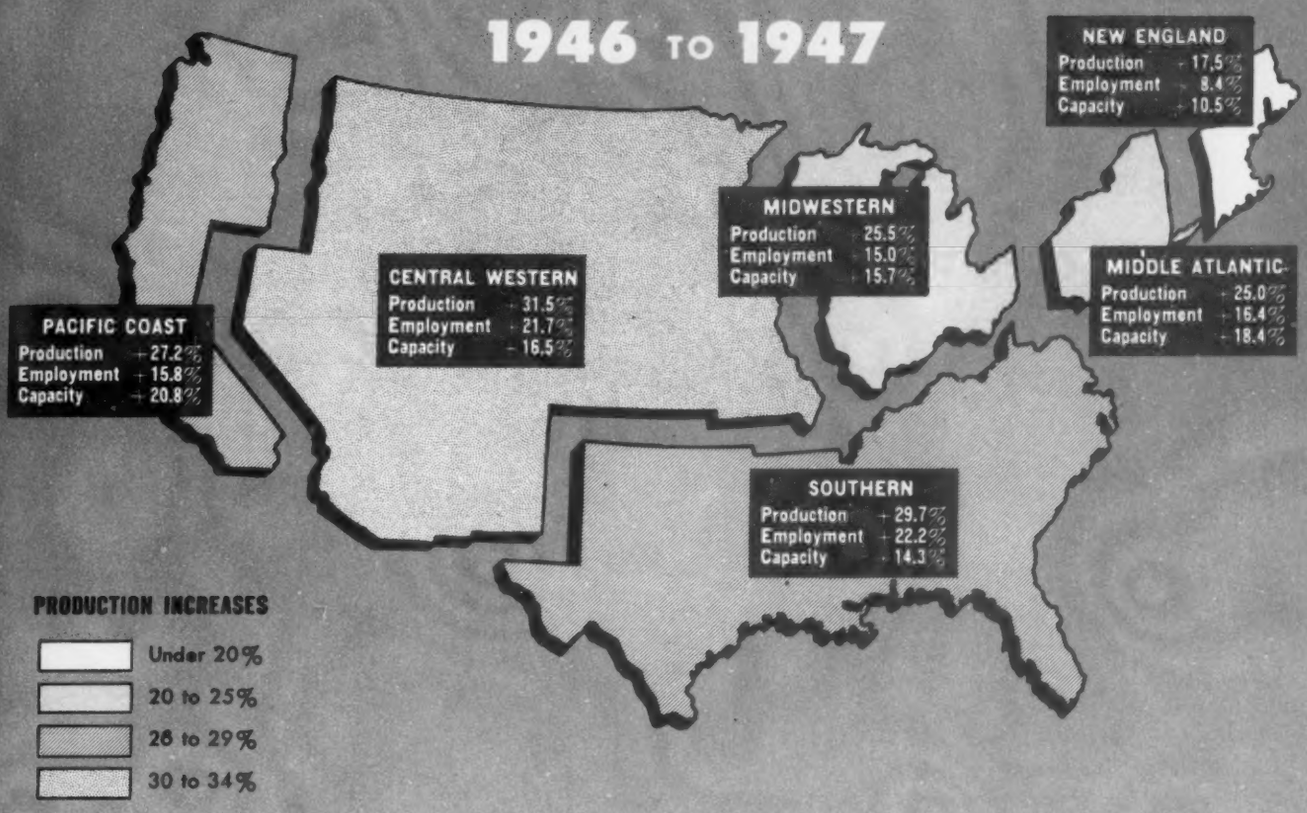
However, these percentages must be interpreted. On the basis of data reported to STEEL by metalworking plants, capacity is divided among the six geographical areas shown above in the following percentages, as expressed in round numbers:

Pacific Coast	7%
Midwest	42%
Central West	7%
South	6%
Middle Atlantic	29%
New England	9%

Thus a 70 per cent increase in capacity in the Midwest and a 67 per cent increase in the Middle Atlantic States actually represents several times the 99 per cent increase on the West Coast. And the 115 per cent increase in dollar volume of production in the Midwest represents much more goods than the 128 per cent increase in the Central West.

It is interesting to note that consumption of carbon steel for a typical three-month period in 1946 was as follows for these areas: Pacific Coast 7 per cent; Midwest 41 per cent; Central West 6 per cent; South 11 per cent; Middle Atlantic 30 per cent and New England 5 per cent. The deviations in comparative percentages may be accounted for by the character of the industry in the several areas. New England, as an example, has relatively fewer large consumers of car-

in Production...Employment...Capacity



bon steel such as shipyards, a large portion of metalworking activity being devoted to machine tools, specialties and nonferrous metal products.

Hope To Hold Wartime Gains

Off hand, it would seem to be surprising that the West Coast still looks ahead to broader horizons, in view of the spectacular expansion in shipyards, aircraft and other plants during the war. However, to feed parts and components to these giant plants required the expansion of hundreds of smaller metalworking plants, and new companies quickly entered the field. Many of these plants now have turned aggressively to the civilian market for business.

Confidence in the future of Central Western States, as well as the Pacific Coast, is expressed by the steel industry in the expansion and modernization of its Western plants, as well as in the purchase of the war-born Geneva, Utah, steelworks by the U. S. Steel Corp. Producers of light metals on the West Coast also envision an excellent market ahead.

West Coast metalworking plants already are planning a further increase of 9.42 per cent in capacity in 1948 and 1949, in addition to the 20.8 per cent on the books for 1947. Thus, based on current plans only, West Coast capacity by the end of 1949 will be 30.2 per cent larger than it was in 1946.

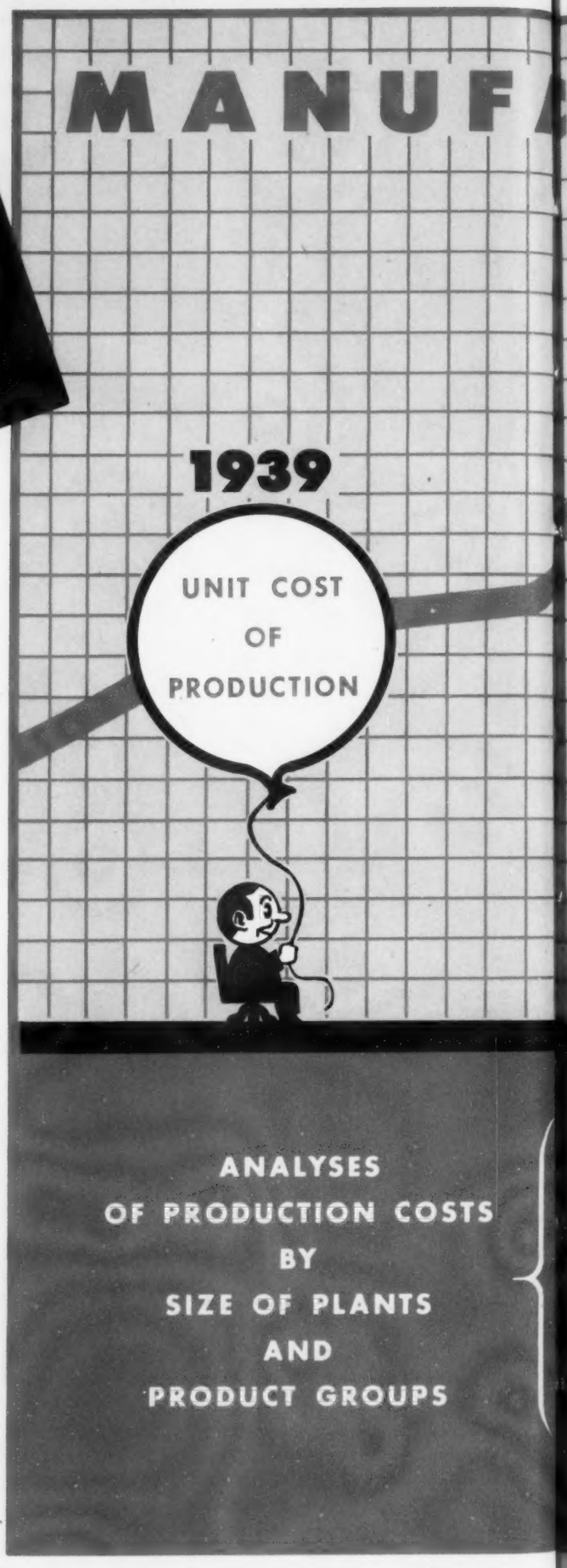
Industrial East Is Growing

Dollar volume of new construction, however, will be greater in other areas in the next three years. Plants in the Middle Atlantic States plan to expand capacity by 23.5 per cent and in Middle Western States by 21.9 per cent. The ten states in these two areas account for more than 70 per cent of all metalworking production.

Capacity increases planned by New England plants in the next three years total 13.7 per cent, by Southern plants 17.9 per cent and by Central Western plants 20.7 per cent.

While the geographical center of the metalworking industry undoubtedly has shifted slightly westward and southward in the past several years and appears destined to shift a little more, this fact loses its significance when it is realized that the West is simply going through a period of growing pains which once were experienced by the East.

Production Costs Are Expected to Increase Further



UNIT production costs have increased sharply since 1939 and are expected to continue to advance moderately in 1947.

The increase has been tempered by near-capacity operation, which to some extent has offset even greater rises in the cost of labor.

Since 1939 production costs have advanced more rapidly than selling prices, but this year selling prices are expected to rise slightly more than manufacturing costs, to correct an inequitable situation imposed by OPA.

Manufacturing Costs Are Higher

Nearly nine of ten metalworking companies report increases in unit production costs over prewar levels. The average increase for these companies is estimated at 41.7 per cent.

However, 7.3 per cent of metalworking companies report manufacturing costs have decreased during the war and early postwar period; the average decrease of these companies was 18.9 per cent. Only 4 per cent of companies indicate no change in production costs.

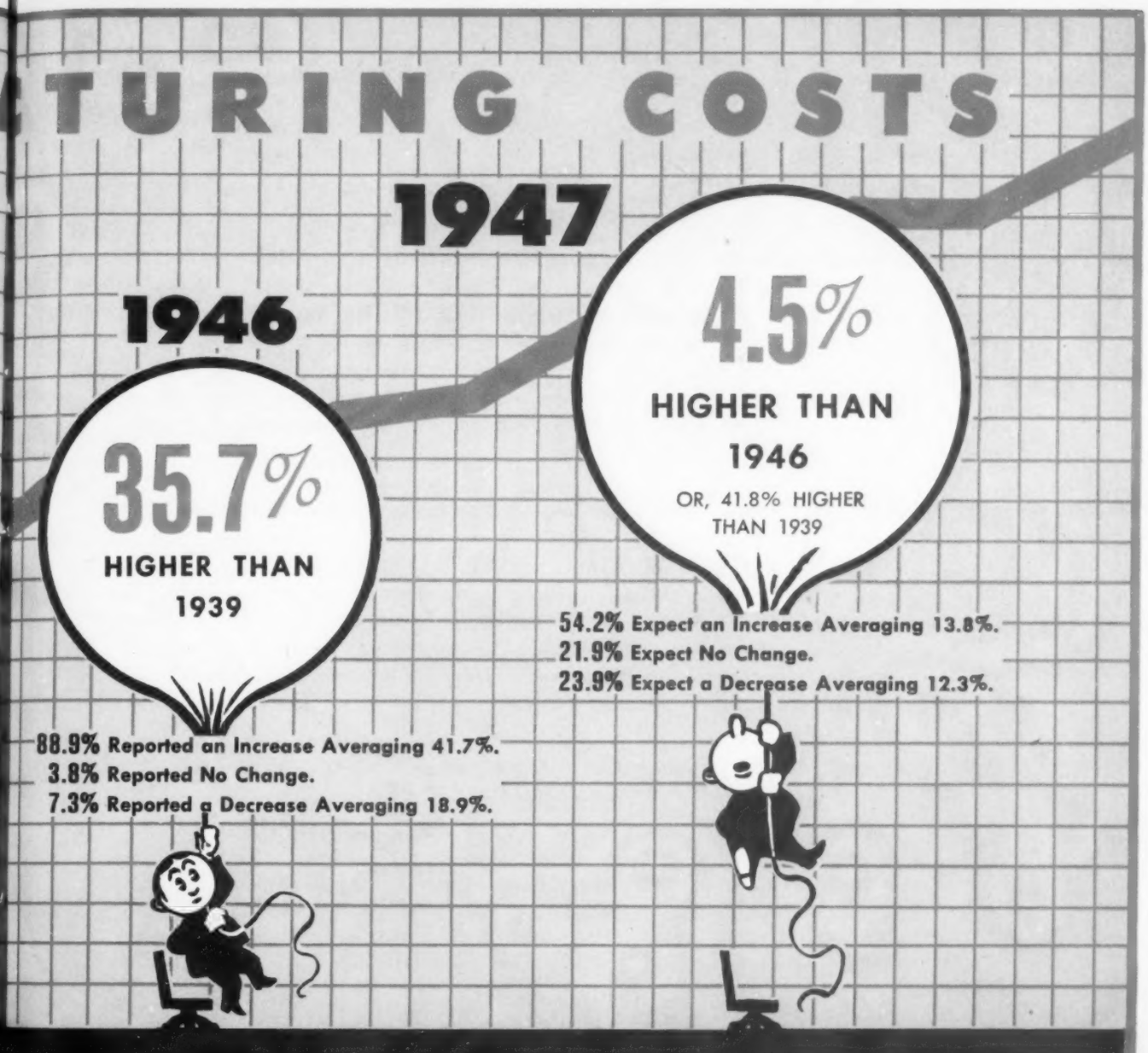
The net increase in unit production costs for the industry as a whole from 1939 to 1946 was 35.7 per cent.

Three major factors caused the advance in manufacturing costs: 1—Higher wage rates; 2—lower worker productivity; 3—advanced cost of materials.

Other contributing factors in raising 1946 costs were interruptions to production caused by strikes, materials shortages, and delays in obtaining production equipment. The extraordinary measures which at times were necessary to obtain materials, equipment and labor under conditions prevailing last year also added to costs in many instances.

Only moderate rises in unit production costs are expected in 1947. Net increase for the industry as a whole is predicted as 4.5 per cent, and one division of

FACTURING COSTS



SIZE OF PLANT	1946 INCREASE OVER '39	1947 INCREASE OVER '46
Less than 50 Employees	29.3%	4.7%
50-100 Employees	35.8%	4.5%
100-500 Employees	37.7%	4.9%
500-1000 Employees	36.7%	5.1%
Over 1000 Employees	40.7%	3.0%
Total—Entire Industry	35.7%	4.5%

PRODUCT GROUP	1946 INCREASE OVER '39	1947 INCREASE OVER '46
Primary Metals	33.2%	5.4%
Fabricated Metal Products	36.7%	4.5%
Machinery	31.6%	6.0%
Electrical Equipment	43.2%	–0.04%
Transportation Equipment	36.2%	1.3%
Total—Entire Industry	35.7%	4.5%

HOW METALWORKING PLANTS EXPECT TO REDUCE COSTS AND INCREASE OUTPUT

84.8% PLAN TO

BUY NEW, MORE MODERN PRODUCTION EQUIPMENT—Although huge quantities of machine tools, presses, furnaces and other types of production equipment were purchased during the war, the cost-conscious metalworking industry reports unusual interest in the newer models now being offered. Over 95% of the larger plants employing 500 workers and over plan such purchases. Interest runs high among smaller plants, too.

66.8% PLAN TO

INSTALL MODERN MATERIALS HANDLING EQUIPMENT—The metalworking industry has gone a long way in improving its material handling methods for the purpose of alleviating worker fatigue and lowering costs, but the possibilities still are unlimited. Over 93% of the large plants employing over 1000 workers will buy equipment. The transportation equipment industry, which includes automotive plants, will be the leading buyer.

78.1% PLAN TO

REVAMP PLANT LAYOUTS TO IMPROVE FLOW OF WORK—During the war, it was further demonstrated that properly arranged production equipment served by well-selected handling equipment can result in greatly increased production. Well over 90% of the large plants plan to revamp their plant layouts. More than 60% of the smaller plants also are giving their attention to this problem, the solution of which will provide more business for equipment builders.

70.4% PLAN TO

IMPROVE THEIR PRODUCTION CONTROL SYSTEMS—Statistical and other control methods for converting materials into component parts and assembling these parts into completed products with the least lost motion is absorbing an increasing amount of attention on the part of production executives. In fact, improved production control systems are planned by more than three-fourths of the plants employing 100 workers and over.

59.0% PLAN TO

REDESIGN PRODUCTS TO USE MATERIALS EFFECTIVELY—As a means of reducing costs, design and production engineers are constantly studying ways in which materials and fabricating methods may be used most effectively in producing simpler parts which can be easily assembled. The electrical industry, with 88.1% of its members planning product redesigns, tops the list of individual industries.

the industry, manufacturers of electrical machinery and equipment, expects a slight decrease. This industry, however, experienced the greatest increase from 1939 to 1946.

Primary metals producers expect unit costs to advance 5.4 per cent next year. This is predicated to a large extent on anticipated higher prices for labor and materials, particularly coal. Unit production costs for primary metals increased by one third from 1939 to 1946, slightly less than the increases experienced by the metal consuming groups.

High Operations Temper Cost Increase

Unit production costs for 1946 would have advanced far more than they did if it had not been for near-capacity operations in practically all metalworking plants —when strikes, labor and materials shortages were not retarding operations.

The efficiencies and savings in unit costs resulting from a high level of operations in practically all metalworking plants are well known. The dollar volume of 1946 production, 122 per cent greater than in 1939, attests to the relatively high operations.

Had the industry not been plagued by strikes and work stoppages with resultant shortages of materials, the savings in unit costs from high-volume operations during 1946 would obviously have been much greater. The steel producing industry, for example, would have averaged 90 per cent or more of capacity had it not been for the steelworkers' strike and the two coal strikes. Not only did these three major stoppages push average operations down to a much lower level but the disruptions caused by these curtailments entailed great expense to the producing companies. In addition, many hundreds of thousands of tons of steel was lost by minor work stoppages, often over trivial disputes.

Whereas unit production costs advanced 35.7 per cent from 1939 to 1946, selling prices rose only 25.4 per cent, although a substantial portion of this lag was due to the price controls in effect until late last year.

In some cases it was possible for manufacturers to concentrate on profitable items at the expense of the loss items. This, of course, created grave dislocations in the general picture and caused acute shortages of the items which were slighted because they could not be produced except at a loss. Thus were created many of the bottlenecks which were characteristic of 1946.

ANALYSES BY SIZE OF PLANTS AND PRODUCT GROUPS

BY PLANT SIZE:	PLAN TO BUY NEW PRODUCTION EQUIPMENT	PLAN TO BUY NEW HANDLING EQUIPMENT	PLAN TO REVAMP PLANT LAYOUTS	PLAN TO IMPROVE PRODUCTION CONTROLS	PLAN TO REDESIGN THEIR PRODUCTS
Less than 50 Employees	73.1%	48.2%	64.0%	56.0%	46.8%
50-100 Employees	85.4%	59.3%	76.6%	69.2%	62.1%
100-500 Employees	87.2%	75.8%	83.0%	77.0%	61.4%
500-1000 Employees	97.7%	81.7%	87.4%	80.0%	68.4%
Over 1000 Employees	94.8%	93.2%	93.7%	77.6%	64.3%
Total—Entire Industry	84.8%	66.8%	78.1%	70.4%	59.0%
BY PRODUCT GROUP:					
Primary Metals	85.4%	74.2%	73.6%	57.8%	20.8%
Fabricated Metal Products	84.6%	70.8%	78.8%	68.9%	51.8%
Machinery	83.8%	57.9%	75.7%	72.5%	68.3%
Electrical Equipment	86.1%	68.9%	89.4%	82.4%	88.1%
Transportation Equipment	87.1%	79.2%	82.9%	76.3%	66.7%
Total—Entire Industry	84.8%	66.8%	78.1%	70.4%	59.0%

Higher S

54.1% of All Plants Reported an Increase Averaging 25.1%.
33.4% Reported No Change.
12.5% Reported a Decrease Averaging 18.7%.

39.9% of All Plants Expect an Increase Averaging 13.2%.
55.5% Expect No Change.
5.1% Expect a Decrease Averaging 9%.

METALWORKING industry reports that the cost of selling and distributing its products has increased less since 1939 than any other major cost factor.

This year, however, sales and distribution costs will rise more closely in line with production costs and selling prices.

A seller's market prevailing since the beginning of the war has required little effort on the part of manufacturers to move goods into buyers' hands.

Metalworking companies are building up sales and distribution organizations against the return of a buyers' market, and some find a buyers' market already exists for their products. Others expect a sellers' market to continue through 1947.

Increase in Sales Costs Slight

From 1939 to 1946, average increase in the cost of sales and distribution for all classes of metalworking companies was 11.2 per cent. This increase is much less than the average increase of 35.7 per cent in unit production cost and 25.4 in average selling prices.

For 1947, the average increase in sales and distribution costs is expected to be 4.8 per cent. It thus is more closely in line with the increase in selling prices and in unit production costs, which are expected to rise 7.1 per cent and 4.5 per cent, respectively.

Greatest increase in sales costs from 1939 to 1946 is reported by electrical equipment manufacturers. This group's average increase was 18.4 per cent. They also expect the largest increase in 1947 sales costs, 5.8 per cent against the industry average of 4.8 per cent.

Smaller companies expect their sales costs to rise more this year than do the larger companies. Plants employing less than 50 predict a 5.9 per cent increase in 1947, as against 3.9 for all companies employing more than 500 workers.

Sellers' Market Keeps Costs Down

The comparatively low increases in selling costs is attributed to the excess of demand over supply during the past five years. From the time the first wave of material conservation orders cut off a large share

erselling Costs Expected

of civilian production at the beginning of the war, an eager market has awaited virtually all types of metal goods. For some products, demand has been frantic.

During the war, many plants sold their entire output to the government or to other plants on government contract. After the initial contract was established, little sales effort was necessary.

Thus, early in the war sales forces became virtually surplus personnel. Many industrial sales people drifted into other lines of employment or joined the military services.

Some companies attempted to hold on to a nucleus of its sales force by assigning salesmen to other jobs. Thus many salesmen during the war found themselves chasing priorities, expediting material, performing personnel work, and similar jobs. Some were assigned to planning postwar sales campaigns. Some continued on sales forces and spent most of their time explaining to old customers why wanted goods could not be delivered.

When the war ended, many sales forces were only about 10 per cent as large as they had been when the war started.

With the advent of peace and reconversion to civilian goods production, metalworking companies began to rebuild their sales forces and to reorganize their distribution channels. This has progressed with varying degrees of success during the past 15 months.

Many salesmen who went into the armed services now have been released and have rejoined their companies. Some who went into production work for the emergency have returned to sales work.

New Sales Outlets Sought

Among distributors, many casualties occurred when the flow of civilian goods dried up during the war. A considerable number of these went out of business. Some have reopened, but in many cases manufacturers have had to seek new outlets for their products.

By and large, distribution of the metals products has not yet become a problem to producers, although a limited number report they entered a buyers' market late last year.

Practically all recognize that well organized sales forces and a good pattern of distributors will be essential when the tide begins to turn.

ANALYSIS BY SIZE OF PLANTS

SIZE OF PLANT	1946 INCREASE OVER '39	1947 INCREASE OVER '46
Less than 50 Employees	8.3%	5.9%
50-100 Employees	10.1%	4.8%
100-500 Employees	12.8%	4.5%
500-1000 Employees	16.7%	3.9%
Over 1000 Employees	10.9%	3.9%
Total—Entire Industry	11.2%	4.8%

ANALYSIS BY PRODUCT GROUPS

PRODUCT GROUP	1946 INCREASE OVER '39	1947 INCREASE OVER '46
Primary Metals	11.5%	5.7%
Fabricated Metal Products	11.2%	4.5%
Machinery	11.5%	5.0%
Electrical Equipment	18.4%	5.8%
Transportation Equipment	9.8%	2.5%
Total—Entire Industry	11.2%	4.8%

Moderate Rise in Prices Seen

SELLING prices of metals and metal products have necessarily advanced over the prewar level, but the increases are moderate in comparison with general price increases and particularly so in light of the heavy wage rate increases the industry has been forced to grant.

Prices have advanced less than production costs.

Expected increases for 1947 are temperate. Metalworking companies indicate they will attempt to avoid pricing themselves out of markets.

Average Rise Since 1939 Is 25.4 Per Cent

Nearly nine of ten metalworking companies report they have increased selling prices an average of 28.8 per cent. Only one out of every hundred has been able to reduce selling prices and about one in ten has been able to hold them unchanged.

The average increase of 25.4 per cent has been fairly shared by all sizes of manufacturers and by all product groups. Large companies have increased selling prices slightly more than the smaller companies, increases ranging from 28.2 per cent for those employing more than 1000 down to 24.5 per cent for those employing less than 50.

Electrical equipment makers obtained and made advances averaging 32 per cent since 1939; with all other products groups slightly below the industry average.

The price ceilings maintained on metals and metal products until near the end of 1946 are largely responsible for the relatively low increases in selling prices of these items. Ceilings were established generally at prewar levels and only scattered relief was granted until early in 1946. At that time an increase in steel prices averaging about $5 a ton followed settlement of the steel strike on a basis of wage increases of 18½ cents an hour. The steel price increase, although less than 10 per cent, combined with wage increases granted by other metalworking industries and the trend toward lower worker productivity necessitated price relief for many metal products. OPA gradually became more liberal in granting price increases, although the advances permitted were spotty and often inadequate.

Price increases for metals and metal products from 1939 to 1946 are less than half the amount percentagewise of wage increases granted by industry during the same period. Average hourly earnings in the steel industry advanced from 84 cents in 1939 to $1.36 in 1946, an increase of 62 per cent. Gross hourly earnings in all durable goods manufacturing advanced from 69.8 cents in 1939 to $1.175 in 1946, or 68 per cent.

Prices Trail Increase in Production Costs

While selling prices for metals and metal products were advancing 25.4 per cent, unit production costs for these products increased an average of 35.7 per cent.

As a result, more metalworking companies reported losses last year than in 1939 and the amount of profit on those companies which were in the black was smaller than in 1939.

Only the high volume of production, making for manufacturing efficiencies, the advantages of the carryback tax laws, and the spreading of overhead costs, made profits possible for a substantial portion of the industry.

Moderate Increase Expected in 1947

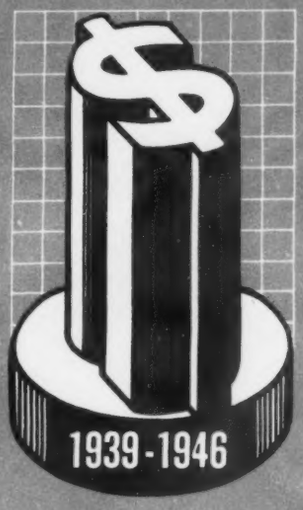
An average increase of 7.1 per cent in prices of metals and basic components is expected by the industry this year.

These estimates are predicated on continuation of the cost trend evident in the closing weeks of 1946. Obviously, a new round of wage increases and the advance of other manufacturing costs could necessitate upward revision of present plans.

Expectations for 1947 pricing include the further correction of inequities arising under OPA control. Some manufacturers will raise prices considerably more than the average. Nearly three fifths of the companies expect to increase prices and the average advance planned by these companies is 13.2 per cent. More than a third of the industry, however, plans to make no change in selling prices and 5.8 per cent expect to lower prices.

Should the expected pattern materialize this year, the metalworking industry will have shown itself a stabilizing factor. The total increase in prices will be substantially less than the increase in unit production cost and far less than the cost of labor.

SELLING PRICES



THE INCREASE IN SELLING PRICES IN 1946 COMPARED TO 1939 WAS

25.4%

89.3% Reported an Increase Averaging 28.8%.
9.6% Reported No Change.
1.1% Reported a Decrease Averaging 25.8%.

THE INCREASE IN SELLING PRICES EXPECTED IN 1947 OVER 1946 IS

7.1%

58.4% Expect an Increase Averaging 13.2%.
35.8% Expect No Change.
5.8% Expect a Decrease Averaging 10.5%.

ANALYSIS BY SIZE OF PLANTS

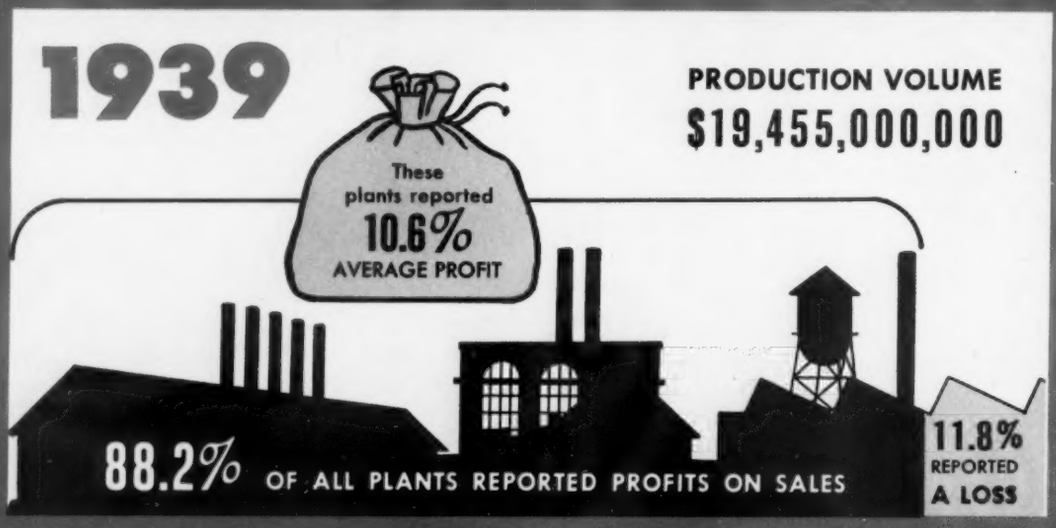
SIZE OF PLANT	1946 INCREASE OVER '39	1947 INCREASE OVER '46
Less than 50 Employees	24.5%	6.4%
50-100 Employees	25.0%	7.1%
100-500 Employees	25.4%	7.4%
500-1000 Employees	28.7%	5.3%
Over 1000 Employees	28.2%	8.9%
Total—Entire Industry	25.4%	7.1%

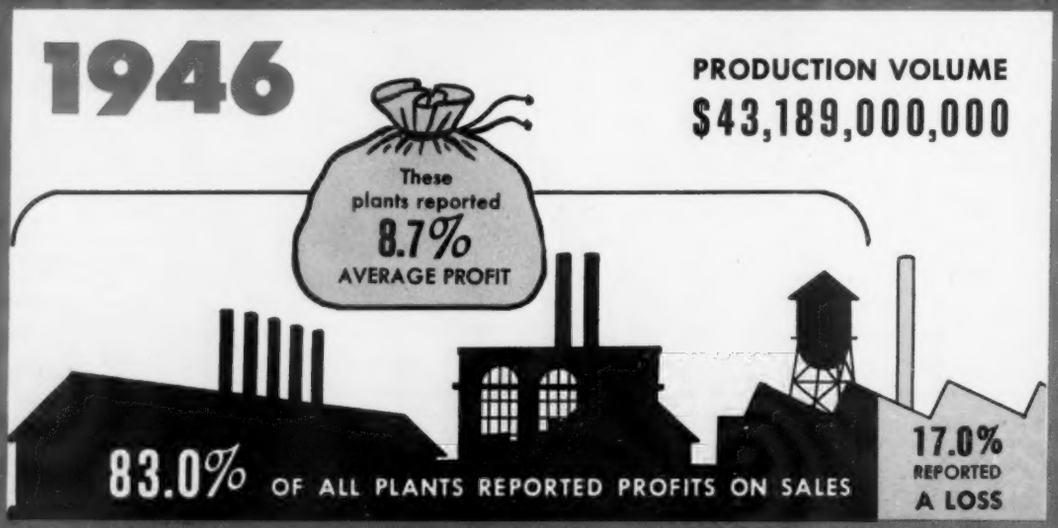
ANALYSIS BY PRODUCT GROUPS

PRODUCT GROUP	1946 INCREASE OVER '39	1947 INCREASE OVER '46
Primary Metals	24.9%	7.5%
Fabricated Metal Products	25.0%	6.4%
Machinery	24.6%	7.7%
Electrical Equipment	32.0%	7.5%
Transportation Equipment	24.3%	6.9%
Total—Entire Industry	25.4%	7.1%

PROFITS

SELLING PRICES
—
mfg. costs
sales costs
TAXES
other EXPENSES
=
PROFIT OR LOSS


1939
PRODUCTION VOLUME
$19,455,000,000
These plants reported
10.6%
AVERAGE PROFIT
88.2% OF ALL PLANTS REPORTED PROFITS ON SALES
11.8%
REPORTED
A LOSS


1946
PRODUCTION VOLUME
$43,189,000,000
These plants reported
8.7%
AVERAGE PROFIT
83.0% OF ALL PLANTS REPORTED PROFITS ON SALES
17.0%
REPORTED
A LOSS

Many Variables in Profit Picture

NINETEEN hundred and forty-seven will be the first year since the war started in which the domestic economy will be relatively free from controls and regulations.

Freedom from many controls lends a bright hue of optimism to metalworking's profit outlook, but these hopes and expectations are based upon many variables and many "ifs".

Many "Ifs" in Profit Picture

Profits will be good *if* production attains the anticipated volume; *if* operations are not disrupted by labor strife; *if* costs do not get out of hand; *if* buyer resistance does not increase too much. In 1946, a year in which production reached new peacetime heights, more companies lost money than in 1939 and the return on sales was lower.

Metalworking companies expect 1947 profits on sales will be larger than in 1946, but smaller than in 1939. However, the increase in volume of sales is expected to make the total profits higher than in any recent year.

Smaller companies expect to earn a larger percentage of profit on sales than do the larger companies and metal consuming companies anticipate better earnings than do primary metal producers.

Most Companies Expect to Show Profit

More than ninety-seven per cent of all metalworking companies anticipate a profit on sales this year. The average net on sales expected is 9.2 per cent. This would be a slightly higher rate of return than in 1946 but lower than for 1939.

The bright outlook for earnings easily may be darkened by any one or a combination of probable developments this year. Realization of a high level of earnings will hinge on a high-level of output, continued demand for that output, freedom from interruption to operations by strikes, material or labor shortages, and avoidance of further large cost increases.

Under present cost-price relationships, the break-even point of the metalworking industry is high, much higher than before the war. Steel producers, for example, now estimate their break-even points at around 65 to 70 per cent of capacity; before the war, it was 45 to 50 per cent.

Thus near-capacity operations will be necessary over the year if good earnings are to be realized.

Order Backlogs Are Reported Heavy

Current backlogs of orders indicate that most companies should have little trouble in disposing of a large volume of production. Many already are sold out through 1947 or profess to see reasonably firm demand for capacity output. However, metalworking executives know from past experience that a huge backlog of demand can be washed out quickly should general economic conditions take a turn for the worse.

Perhaps the gravest threat to earnings in 1947 is the probability of another round of strikes. Not only would widespread work stoppages cut the volume of production, but they would dissipate purchasing power of consumers, aggravate material shortages, create expensive dislocations between interrelated divisions of the industry and boost costs.

Material and labor shortages will continue a very real threat to high operations and good earnings throughout 1947. The metal consuming capacity has been increased to such a degree that full operation of the primary metals producing capacity is essential to full operation of the fabricating industries.

Further disruption of the cost-price relationship through large increases in wages or other costs could alter the profits outlook quickly. Many industrialists already are worrying over the necessity of increasing selling prices and speculating on the possibility of being priced out of the mass markets. Further cost increases would mean further price increases.

Expect Lower Return in 1947 Than in 1939

Average profit on sales of metalworking companies which operated in the black in 1939 was 10.6 per cent, compared with the 9.2 per cent on sales expected in 1947.

However, only 88.2 per cent of the industry made a profit in 1939; losses were incurred by 11.8 per cent.

ANALYSES OF THE INDUSTRY'S PROFITS AND LOSSES

BY PRODUCT GROUPS	1939			1946		
	PLANTS REPORTING PROFIT	AVERAGE PROFIT ON SALES	PLANTS REPORTING LOSS	PLANTS REPORTING PROFIT	AVERAGE PROFIT ON SALES	PLANTS REPORTING LOSS
Primary Metal Producers	84.6%	8.7%	15.4%	84.0%	7.5%	16.0%
Fabricated Metal Products	90.0%	10.4%	10.0%	86.2%	9.0%	13.8%
Machinery	88.5%	11.1%	11.5%	82.5%	8.5%	17.5%
Electrical Equipment	86.3%	9.7%	11.7%	77.1%	7.7%	22.9%
Transportation Equipment	82.6%	10.2%	17.4%	74.4%	7.8%	25.6%
Total	88.2%	10.6%	11.8%	83.0%	8.7%	17.0%
BY SIZE OF PLANTS						
Less than 50 Employees	81.5%	12.0%	18.5%	85.3%	10.2%	14.7%
50-100 Employees	89.3%	10.9%	10.7%	83.0%	8.8%	17.0%
100-500 Employees	90.6%	9.7%	9.4%	84.0%	8.1%	16.0%
500-1000 Employees	87.3%	9.0%	12.7%	81.5%	7.6%	18.5%
Over 1000 Employees	95.1%	10.3%	4.9%	69.1%	6.7%	30.9%
Total	88.2%	10.6%	11.8%	83.0%	8.7%	17.0%

In 1946, the smallest size companies report earnings were 10.2 per cent on sales; larger companies decreased in proportion to size to 6.7 per cent for those employing more than 1000. The smaller companies also held an advantage in 1939 with a net of 12 per cent on sales. Largest size companies in that year showed slightly higher earnings than the medium size companies.

One reason for the better profit showing of the smaller companies is that they were less affected by strikes and work stoppages than the large companies. Only six of ten reported lost production from this cause in 1946, compared with nine of ten companies employing over 1000.

Metal Consumers Fare Slightly Better

Recorded and anticipated earnings of the metal consuming divisions of the industry are slightly better than those for the primary metal producers. For 1947, the primary metals group expects average profits on sales to be 8.4 per cent. Machinery builders look for earnings of 9.9 per cent, fabricated metals products, 9.6 per cent, transportation equipment, 9.3 per cent, and electrical equipment, 8.9 per cent.

In 1946, only 83 per cent of the metalworking companies operated at a profit, despite a record-breaking volume of business. Those companies which showed a profit reported an average of 8.7 per cent on sales. Reports by individual companies show a large range in 1946.

The unfavorable circumstances—the strikes, the materials scarcities, the reconversion pains—hit the metalworking industries with greater impact than most nondurable goods industries. Thus 1946 profit comparisons show the textile, construction, food and beverage, tobacco, paper, leather industries and retail trade and amusement making much greater profits than the metalworking companies.

Smaller Companies Expect Highest Return

Small and medium-size companies are making a higher percentage of profits on sales than are the larger companies. This holds for 1947 expectations, 1946 experience and, with slight variations, for 1939.

Thus companies employing less than 50 workers, expect to make 10 per cent on sales this year. Expected rate of profit decreases with size of company to 7.8 per cent for those employing more than 1000.

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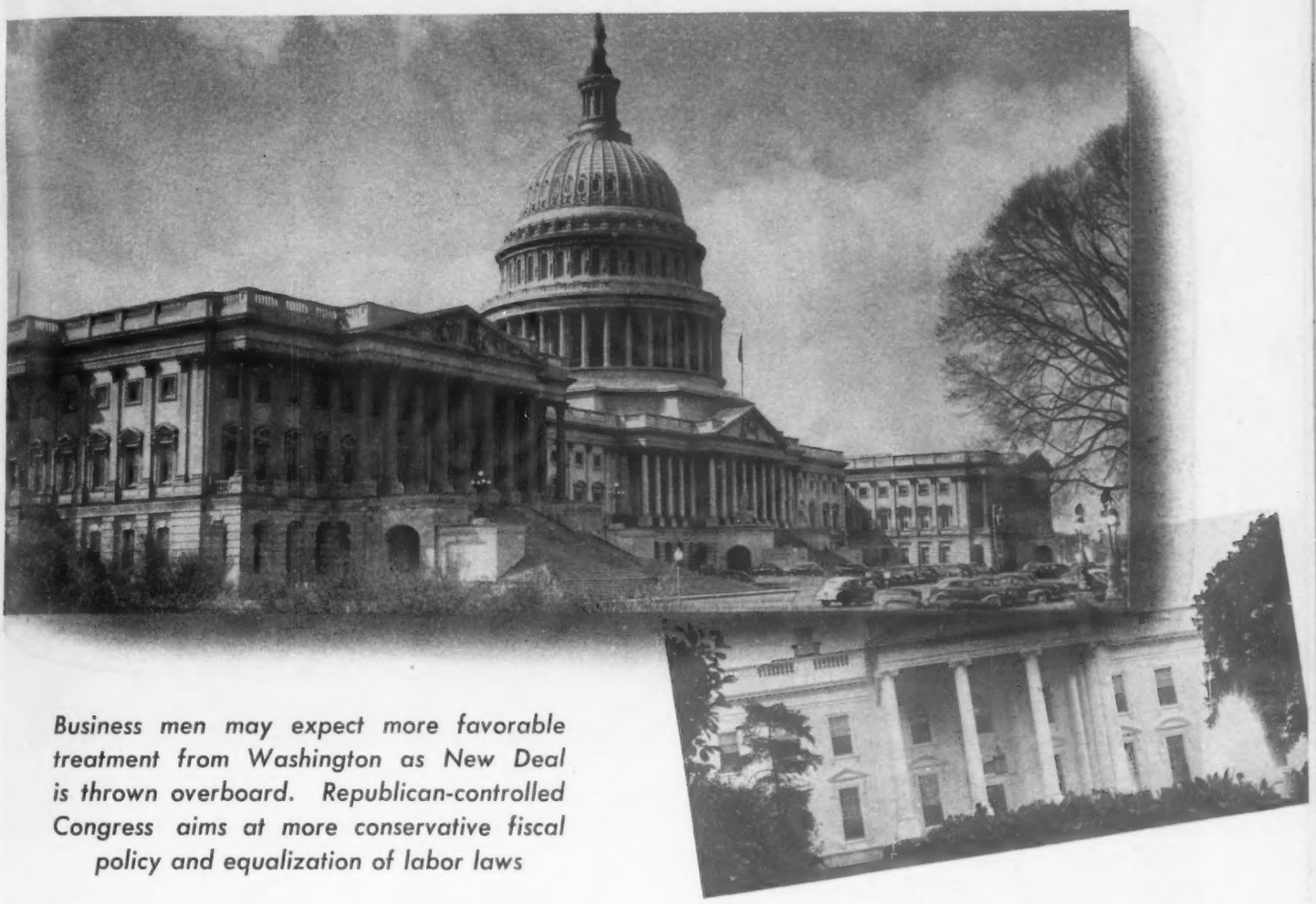
By E. C. KREUTZBERG *Washington Editor, STEEL*

Windows of Washington



Business men may expect more favorable treatment from Washington as New Deal is thrown overboard. Republican-controlled Congress aims at more conservative fiscal policy and equalization of labor laws

The Capitol is expected to re-emerge as the policy-making seat in Washington under the new Republican-controlled Congress. The White House, source of most of the important government decisions for the past 16 years, is destined for a relatively less important role

BUSINESS men have reason to look toward Washington with a fair degree of confidence in the year ahead.

The historic era of "reform" that was inaugurated in 1932 has ended. November election results are interpreted as a mandate to federal officialdom to drop its overall domination and "mother knows best" policies. The Republican-controlled Eightieth Congress is committed to a program of liquidating federal controls and permitting the people more freedom in running their own affairs.

Washington observers are gratified to note that the administration has "got religion" since November. Apparently President Truman and his official family have accepted the people's mandate. Certain actions, such as the administration's battle against John L. Lewis and the United Mine Workers, indicate the Truman administration has lost its fear of offending pressure groups. And the President's action in terminating or easing controls has demonstrated his desire to get all unnecessary controls out of the hands of the government.

Another gratifying development is the White House decision to keep out of disputes between labor and management. The administration now realizes that it made a grave mistake in giving its support to the labor unions when the latter demanded sharp wage advances late in 1945 and early 1946. The White House has had ample time and evidence to see that the wage increases did not come out of profits as the unions contended they could, but that the wage increases necessitated equalizing price advances.

The White House has good political reasons to avoid giving its support to new wage demands, the approval of which would throw the economy further out of gear. Administration economists were given a bad scare by security price declines late in 1946. They were worried over prospects for a sharp business recession during 1947. Today they are less worried. While they admit there may be a recession, the consensus is that it will be brief. The fact that most commodities continue in short supply presages several years of good business. The 1947 recession, if it materializes, they believe, will be in the form of a price strike and, barring more serious inflation, should not be long-lived. This appraisal of the economic outlook has contributed to the administration's decision not to put its influence behind wage demands in the immediate future.

The new Republican-controlled Congress is committed to a more conservative fiscal policy, equalizing of labor

President Truman will have to deal with an opposition Congress during the next two years. Leaders in the legislative branch are committed to a reversal of many of the New Deal policies. NEA photo

laws and freeing the people from excessive federal domination.

Of the "must" assignments of the Eightieth Congress, the No. 1 job is a revision of fiscal affairs with a 4-fold objective: a—Reducing federal expenses; b—balancing the budget; c—reducing the national debt; d—reducing taxes.

No. 2 position has been given to a study of wartime and other federal controls with the object of eliminating all that are no longer needed or that fail to benefit the economy.

The No. 3 job—which may be shifted into No. 1 position if there is need for emergency action when Congress convenes—is an overhauling of the labor laws.

The No. 4 assignment is the eliminating of uncertainty as to the line of Presidential succession whenever in the future the office of Vice President is vacated on the death of a President.

It is of special interest from the standpoint of the business man that the above preliminary agenda fails to include provision for health, housing and social security legislation. The Republican leaders believe the latter type of legislation is necessary, but they think a thorough house cleaning is of the first importance. Present plans are to call up health, housing and social security legislation in the second session—in 1948.

Whereas the Republicans generally promised to sweep away government controls if they were victorious, they have shown a disposition since the election to proceed cautiously. They realize that much of Truman's troubles resulted from a premature termination or modification of wartime controls, and they do not want to make a similar mistake. Sen. Alexander Wiley (Rep., Wis.), chosen by the Senate Republican Steering Committee to head a study group on termination of government controls, realizes the task is a complicated one. His investigations so far disclose that government controls stem out of some 500 laws passed by previous congresses.

"We don't want to make a lot of mistakes through hasty action," says Senator Wiley. "These things have to be studied through."

The senator has made an unusual approach. Although he heads a Republican planning unit, he has called on the Democratic cabinet for help. He has asked Attorney General Tom C. Clark for a report on the problems incident to eliminating government controls.

Senator Wiley would be loath to recommend early congressional approval of a resolution declaring the war at an end. As an example of the difficulties that will be encountered in unscrambling controls, there is the fact that one of the consequences of declaring the war to be at an end would be the expiration, six months later, of the Smith-Connally War Labor Disputes Act. It would not be safe at this time to allow this law to lapse.

Other consequences of a war termination resolution would be a return of excise taxes in six months to their previous level, and the forced return to this country of all troops overseas except regular Army personnel.

Termination of controls, particularly wartime controls,

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Westinghouse calls its new steel encased motor the most revolutionary change in construction in 58 years and states that it delivers up to 134% more power per pound than previous motors.

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Federal Telephone and Radio Corporation will conduct experiments with television, FM and radar in a building at Nutley, N.J., which will be completely shielded from atmospheric electricity.

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Called the world's largest, a spot welder that can make 48 welds at a single stroke is in use at Pullman-Standard Car Manufacturing Co.

get ready with CONE for tomorrow

A division of Reynolds Metals Company has a new line of all-aluminum bicycles and scooters.

be ready with CONE for today

Raytheon Mfg. Co. has an electronic kitchen range. The food is put in a disposable dish and quickly cooked by the energy from a magnetron tube.

get ready with CONE for tomorrow

Bell Telephone Laboratories report that they have developed a tube that will send a hundred million words per minute by telegraph.

be ready with CONE for today

The Army Air Force has contracted with Fairchild Engine and Airplane Co. for fundamental research in the use of atomic energy in aircraft.

get ready with CONE for tomorrow

Aluminum Co. of America has recently supplied a 100-foot all-aluminum span for a railroad bridge at Massena, New York.

The Souhegan Mills of Wilton, N. H., believes that its molded board, made of shavings, can compete in price and utility with plywood or lumber.

be ready with CONE for today

The U. S. Bureau of Mines finds that Freon II is more effective in fighting gasoline fires than any of the other gases tested.

get ready with CONE for tomorrow

Patent 2,404,206 has been granted for a method of mining practically pure copper by dissolving it chemically and accumulating it electrolytically.

be ready with CONE for today

Nylon drive ropes are said by Plymouth Cordage Company to reduce machine shut-downs.

The behavior of piston rings and oil films has been studied by the National Advisory Committee for Aeronautics by using a glass engine cylinder.

get ready with CONE for tomorrow

When their new 2-million volt machine is installed, Babcock and Wilcox Co. will have 12 X-ray machines in use for checking steam generating equipment.

be ready with CONE for today

Blaw-Knox has built two 23-cubic yard clamshell buckets for unloading coal on Lake Superior. They weigh nearly 14 tons apiece and are believed to be the largest of their kind.

get ready with CONE for tomorrow

Scientific American prophesies that the use of silicones will bring about a revolution in surface finishes comparable to that resulting from the development of nitrocellulose lacquers.

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put the *tough* ones on a CONE

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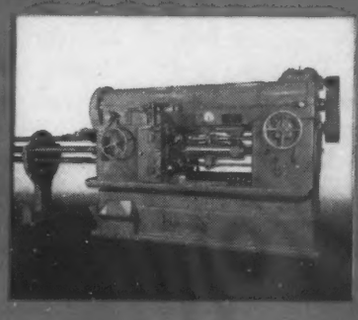

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36

Sen. Robert A. Taft (Rep., Ohio), left, becomes a more powerful force in the new Congress. He will head the Senate Labor Committee

Rep. Joseph W. Martin (Rep., Mass.), right, becomes Speaker of the House and will have important voice in determining Republican party policy

will not be accomplished at one fell swoop but will require the writing of much new legislation. In fact, it may take years to complete the study and map out wise actions. In the meantime, the task of studying elimination of controls will occupy at least two important committees the entire first session—the Judiciary and Banking and Currency Committees of the Senate.

Sen. Joseph H. Ball (Rep., Minn.) who, as head of the labor law study group set up by the Senate Republican Steering Committee, is the leading congressional spokesman in this field until the Eightieth Congress actually becomes organized, hopes that the new Congress will be given time to formulate sound labor policies. More than anything else, he fears the consequences that might ensue if Congress were stampeded by current strikes into enacting remedial labor legislation.

As a starter, says Senator Ball, he is going to introduce a bill to outlaw the closed shop. He expects some opposition but thinks the bill ultimately will become popular since it will deal with two easily understood fundamentals —the rights of individuals, and the effects of labor monopolies. The alternative, he says, would be a law that would establish the rules to govern union activities; that would require setting up a big new bureaucracy and probably would result in an unworkable situation.

Fairly speedy action could be taken, says Senator Ball, in passing most of the provisions of the Truman-vetoed Case bill—such as strengthening the federal mediation procedure, making unions suable for breach of contract, outlawing secondary boycotts, prohibiting formation of foremen's unions, and providing for sound administration of safety and welfare funds.

But Senator Ball admits he has no answers to the problem of preventing industry-wide strikes which are so inconvenient to the public and so damaging to the economy. It is one thing to talk about making industry-wide shutdowns illegal, he says, but something else again to devise a law which will prove fair to labor and gain acceptance. He feels the same way about the renewed suggestion, by Senators Ferguson and Fulbright, for a specialized labor court; it would be necessary to define the duties, powers and procedures of such a court—and that, he fears, is a job that would require intensive work over a period of two to three years.

Senator Ball's present feeling is that the main need for remedial labor legislation can best be met through amending the Wagner Act. It has been a long time, he says, since Congress has studied the Wagner Act. A protracted series of hearings by the new Senate Labor & Welfare Committee to uncover the inequities of the Wagner Act and decide on the remedies will be his recommendation to the Senate.

One of the big needs in amending the Wagner Act is to give the employer power to fight back in cases of labor disputes, says Senator Ball. Today, he told STEEL, the risk of trying to operate a struck plant is too great, and unions win by default. A number of changes in the Wagner Act, he believes, will cure this situation without actually hurting labor. Senator Ball feels that one of the greatest curses in the field of labor disputes, the jurisdictional strike, can be eliminated by amending the Wagner Act.

It seems advisable at this point to recall that representatives of industry have been backward in appearing before committees of Congress. This has been true all through the years, but it has been particularly true since the New Deal came into control in 1932. While this attitude is understandable in view of the New Deal's persecution of business, it has been an ill-advised policy. There is an old saying in Washington that "the one who yells the loudest for what he wants is the one who gets what he wants."

If employers do not attend the coming hearings of the House and Senate labor committees in numbers, and ask for fair treatment, they will have nobody but themselves

Consider the fastener!

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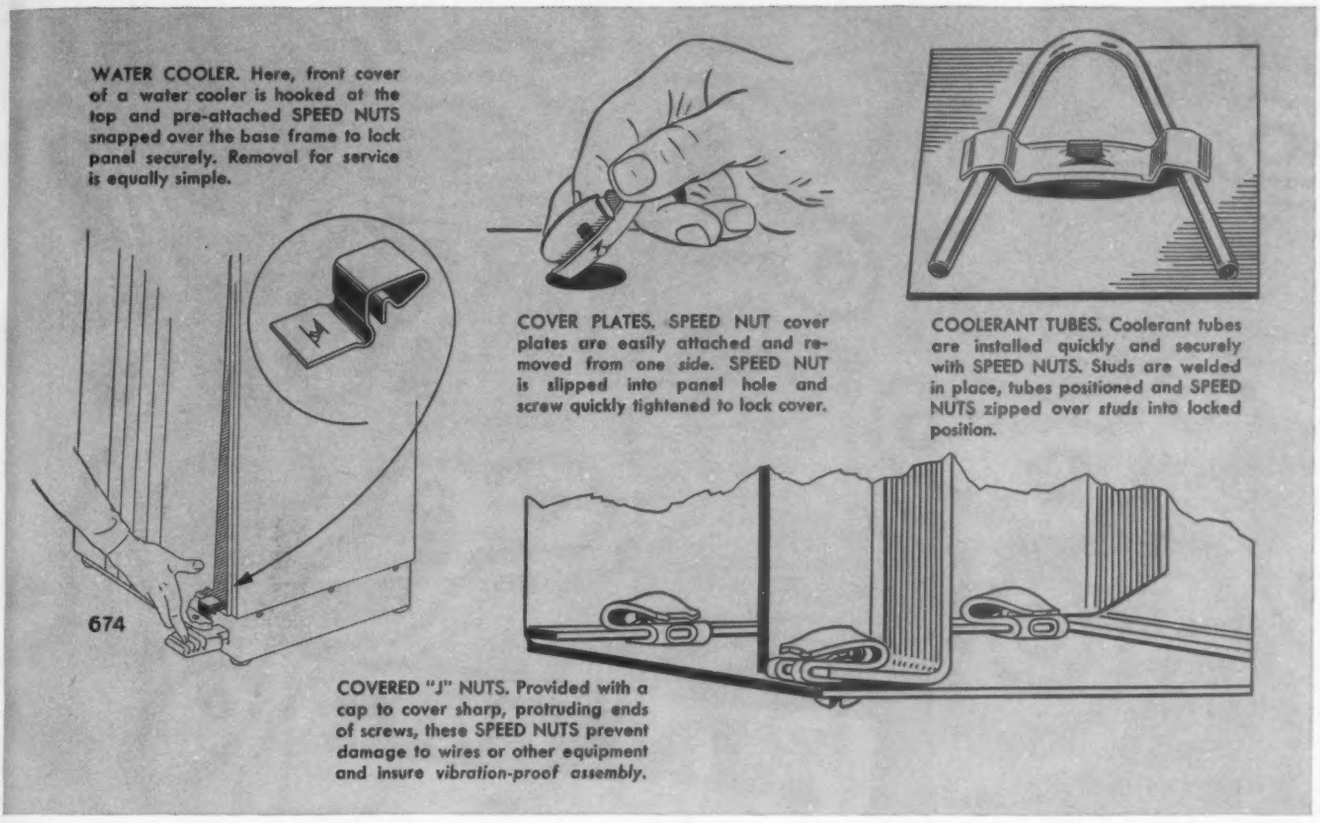
WATER COOLER. Here, front cover of a water cooler is hooked at the top and pre-attached SPEED NUTS snapped over the base frame to lock panel securely. Removal for service is equally simple.
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COVER PLATES. SPEED NUT cover plates are easily attached and removed from one *side*. SPEED NUT is slipped into panel hole and screw quickly tightened to lock cover.
COOLERANT TUBES. Coolerant tubes are installed quickly and securely with SPEED NUTS. Studs are welded in place, tubes positioned and SPEED NUTS zipped over *studs* into locked position.
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Design and Assembly Engineers, who perform seeming miracles every day, are fast becoming fastener conscious. For, with improved fasteners, even greater advantages are gained. Assembly is made faster and less costly. Fewer parts are used. Weight is reduced. And—that old bugaboo, "vibration loosening" is licked once and for all.

Tinnerman SPEED NUTS, widely used in place of ordinary threaded nuts and lock washers for better assembly, are also made in hundreds of special designs. With them, engineers can accomplish today what was impossible yesterday. SPEED NUTS open the door to design possibilities never before fully explored. Look over the sketches above. These are but a few of hundreds of SPEED NUTS designed by Tinnerman to meet special needs. Possibly they will give you an idea of what can be done to secure better fastenings for *your* products.

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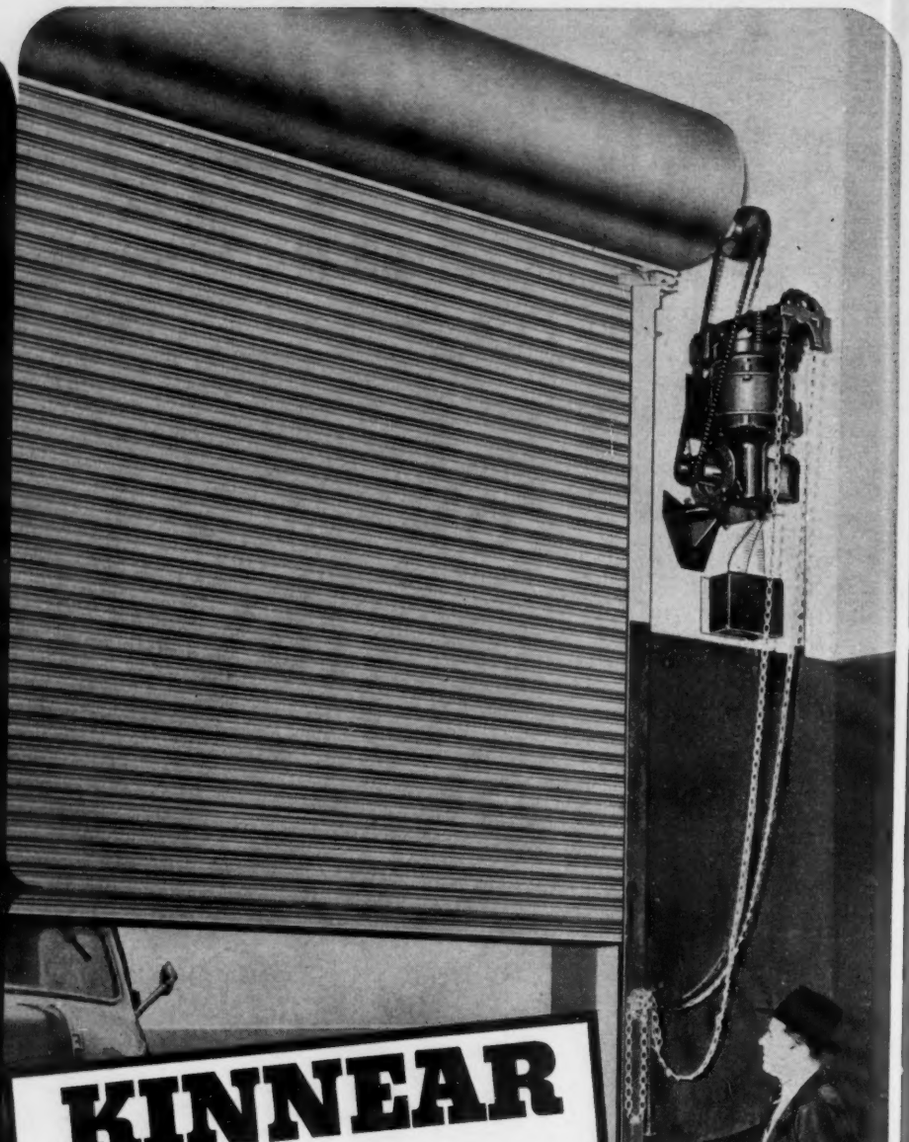

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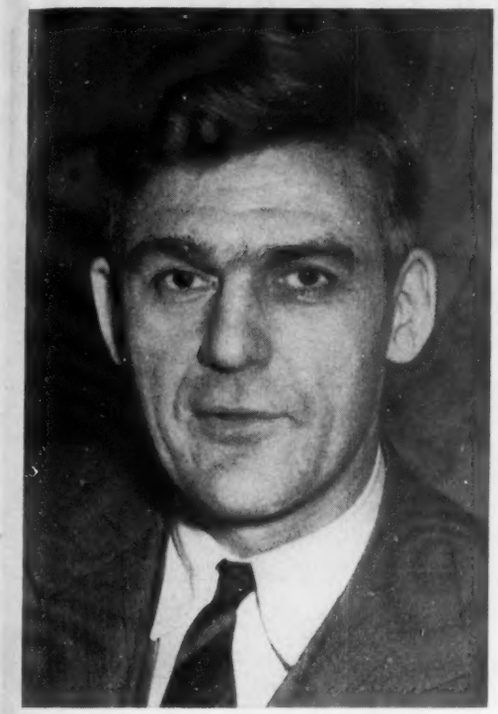
SAVING WAYS in DOORWAYS



Sen. Alexander Wiley (Rep., Wis.), right, will be the leading Republican spokesman on the abolition of wartime controls. Many such controls were abolished by the administration in the closing weeks of 1946

Sen. Joseph H. Ball (Rep., Minn.), left, will have an important role in the framing of new labor legislation to be presented to the 80*th Congress*

to blame if the resulting legislation is not to their liking.

Whether Congress will vote a substantial reduction in taxes for 1947 remains to be seen. It generally is agreed among fiscal authorities that if Congress is willing to cut to the bone it could shrink the current budget of $41.5 billion down to some $30 billion. Whether it will go that far is not yet clear. In this connection it must be pointed out that Republican congressmen are not at all unlike the Democrats in one respect; they all have pet projects which they wish to saddle on the federal treasury. Pork barrel appropriations likely will come to a number of billions.

Those looking for a reduction in taxes are not expected to get much encouragement from President Truman's message on the budget. In view of the recent political trend it might be expected the administration would recommend a maximum reduction in expenditures. And yet, following several months of intensive hearings and study, the Bureau of the Budget early in November had been unable to set the prospective 1948 budget lower than $37 billions.

If the 1948 budget finally is set as high as $37 billions, then the chances for any substantial tax cut probably will have gone glimmering. For the Republicans are determined on one point; they must reduce the national debt substantially during the next two years.

Republican leaders no longer are repeating their optimistic promises of postelection day of a 20 per cent cut in individual income taxes for 1947. Senator Ball and other leaders now append the words "if any" when they discuss prospects for a tax reduction. The current view is that the way to pay off the debt is to collect taxes, and that the time to collect taxes and pay off the debt is when business is good.

Several activities which the Democrats had scheduled for the Eightieth Congress have been dropped. A group of "liberals" headed by Sen. James E. Murray (Dem., Mont.) has full-blown plans for an anti-monopoly drive which would be virtually a continuation and sequel of the old Temporary National Economic Committee program. If this drive materializes at all, it will lack steam. A different complexion also has been placed on contemplated legislation to put the government behind scientific research in this country. If the Kilgore-Magnuson bill is revived it is due for considerable liberalization, particularly in its patent title.

Probabilities are that the Eightieth Congress will take action to unify the armed services, and that the action will be part of the economy drive. The Republican leadership, particularly Sen. Robert A. Taft, as chairman of the Senate Republican Steering Committee, has insisted it will not push economy to the point of crippling the armed services. At the same time, Senator Taft's hope is that $10 to $12 billion will suffice for their needs. Unification, by eliminating competitive overheads and parallel activities, would make it much easier to fit the defense budget within this range.

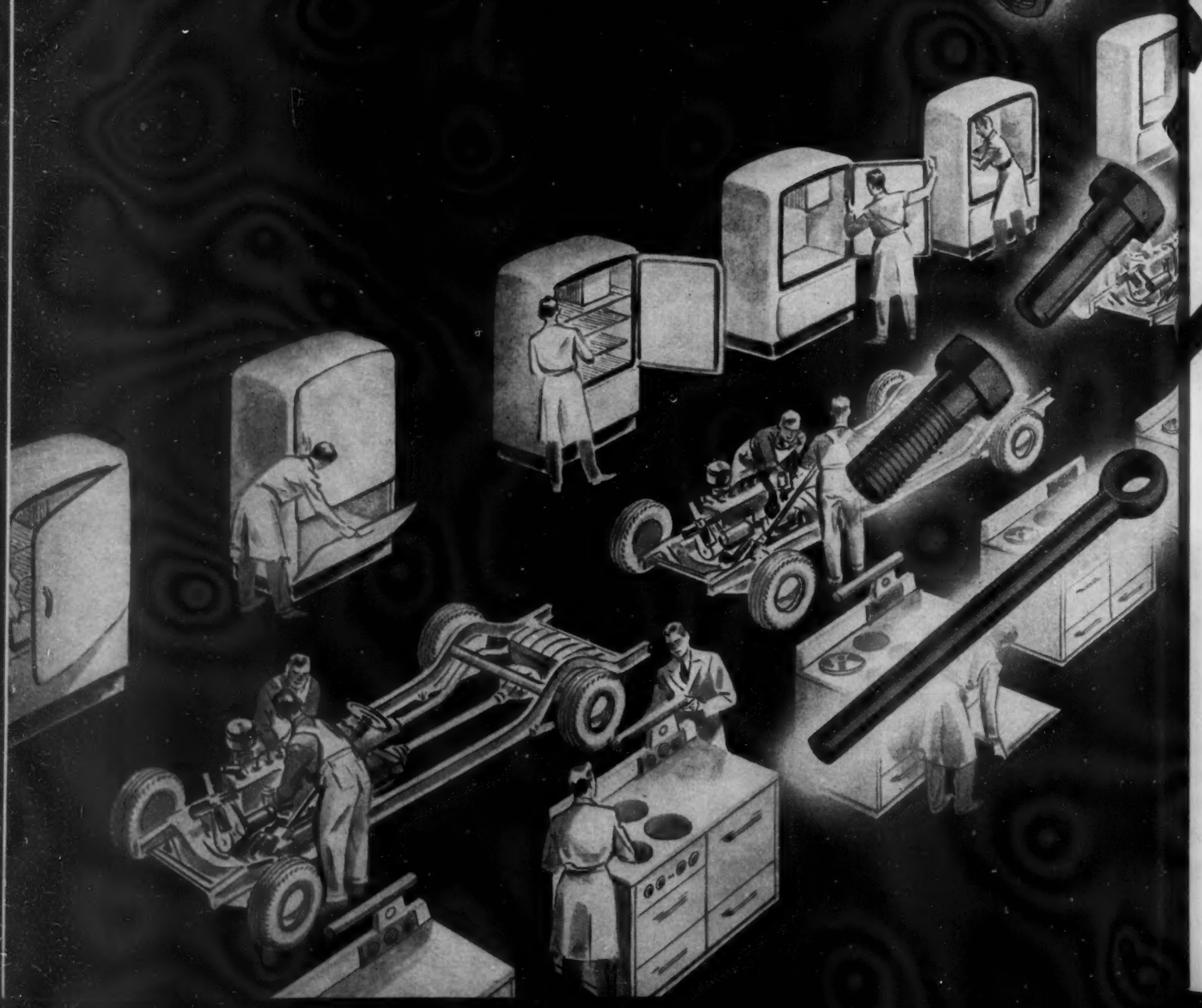
Present indications are that S. 2044 will be introduced in the new Congress and be subjected to thorough study. Approved by the Senate Military Affairs Committee too late for action by the Seventy-ninth Congress, this bill provides for: 1—A single Department of Common Defense, 2—a civilian secretary with membership in the cabinet, 3—equal branches for the Army, Navy and Air Forces, with a secretary heading each, 4—a new Council of Common Defense to consist of the Secretary of state, Secretary of common defense, the three service secretaries and the chairman of new National Security Resources Board.

Excepting for a natural fear on the part of many Army and Navy officers that unification will rob them of promotions at the previous rate, there is a minimum of opposition to the setup that would be provided under S. 2044. Chances for its adoption will be enhanced if the Eightieth Congress, as expected, organizes on the lines of the Legislative Reorganization Act of 1946. That would create a single Committee on the Armed Services in each house, and eliminate bias which automatically existed when there

(*Please turn to Page* 188)

MERGING PRODUCTION LINES..

Raise America's Standard of Living!



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FASTENERS

BOLTS, NUTS, RIVETS, SCREWS, SPECIAL FASTENERS

Make joints strong and secure

The great production lines that make our automobiles, refrigerators, appliances and machines of all kinds are, themselves, the consumers of other mass-produced items, notably Industrial Fasteners. Because of the highly-perfected manufacturing methods used in making bolts, nuts, rivets, screws and special fasteners, manufacturers employing these products are assured of lower costs, faster assembly, dependable joints.

Designers of machinery, appliances and structures of all kinds use Industrial Fasteners with complete confidence in the strength and security of the joints. Fabrication problems are simplified by the dependable uniformity of modern fasteners. For example, nuts made by the tens of thousands according to this industry's standards fit perfectly the bolts which may be made by a different company at a different place; specially designed industrial fasteners and other parts are made economically in large quantities on a basis which permits complete interchangeability. Thus, the Industrial Fasteners industry helps materially in making available to the American public better automobiles, radios, appliances, machines, at lower cost.

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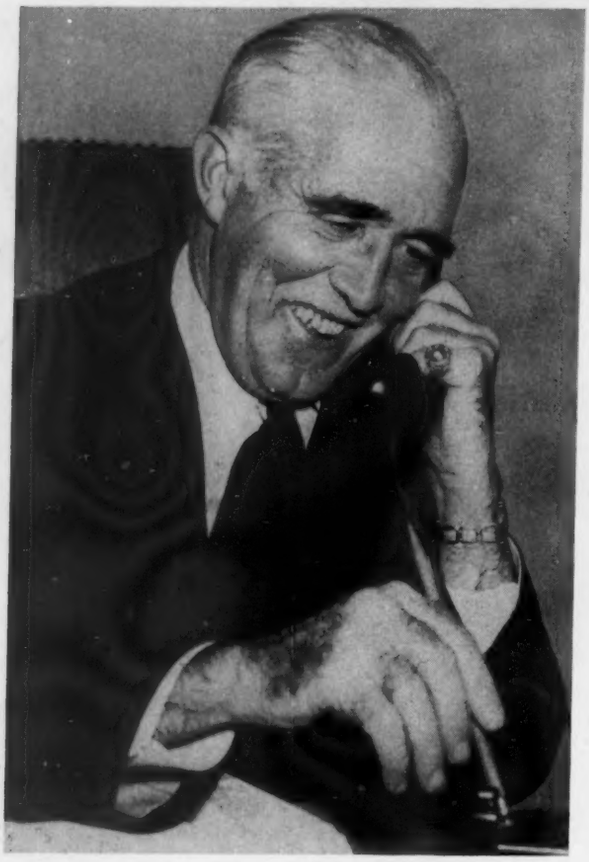


Maj. Gen. Philip Fleming, public works administrator, late last year assumed responsibility for administering the remaining wartime controls as head of the Office of Temporary Controls. NEA photo

(*Concluded from Page* 185)

were separate committees on Military Affairs and Naval Affairs.

Of interest to industry is the likelihood that the scientific research and development programs of the Army and Navy will be retained by the new Congress. There is general acceptance among the lawmakers that national defense and the needs of the civilian economy require a bigger research program than industry and the private institutions can support unaided. Indications are that the Army and Navy will get at least $1.5 billion for such activities in the fiscal year ending in 1948. In fact, the only controversy in connection with such an appropriation is likely to arise as a result of fears of late among some scientists that the Army and Navy are constantly under the temptation of putting the emphasis on research and development work for purely military purposes. There probably will be a move in the Congress to have these expenditures directed by civilians.

Other appropriations for government research programs again should be large, to permit such agencies as the National Advisory Committee for Aeronautics, Food and Drug Administration, Public Health Service, National Bureau of Standards, Bureau of Mines and some 18 others to function adequately.

One important issue which may be decided at the beginning of the new Congress is the fate of the Selective Service Act now due to expire Mar. 31. The big question is whether the War Department will achieve its wish for a universal military training act. Current feeling in Washington is that the fate of this proposal will depend to a large degree on how Russia is behaving at the time the matter comes under consideration.

A possible move of significance to industry would take the United States Conciliation Service out of the Labor Department. Numerous congressmen contend the Labor Department is biased. Senator Ball's study group feels that the Conciliation Service has suffered from this affiliation. A bill to be introduced early in the session would create Conciliation as an independent service, with a mandate requiring unbiased treatment of both sides in labor disputes.

Food price support is expected to take up considerable time of the next Congress. If there is any substantial collapse of food prices, there is a good chance for support at 100 per cent of parity.

Congress will have something to say about the big new trade agreements program which the State Department is preparing to negotiate with 18 countries (STEEL, Dec. 2, p. 84). Some Republican spokesmen say they want to amend the Reciprocal Trade Agreements Act by curtailing the President's authority to reduce tariffs on individual imports; there is a disposition to restore this power to the Congress.

State Department Goal Approved

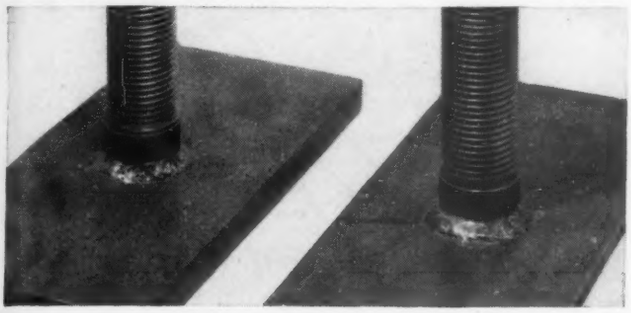
Otherwise, from present indications, Congress will allow the State Department to go ahead with its studies to determine those products on which we will stand ready to grant import concessions in exchange for liberal terms in connection with our exports. There seems to be no criticism of the State Department's goal—"to reduce, modify, or eliminate barriers to trade, such as tariffs, quantitative restrictions, and discriminations" and, in general, to fit the agreements to the terms of the United States-proposed charter for the proposed new International Trade Organization.

Many business men properly regard the number of government employees as a rough index of government preoccupation with the affairs of its citizens at any given time. This index is declining. In 1939 the federal government had about 900,000 employees. Then it started to rise and reached a wartime peak of about 3 million in 1943. For the first quarter of 1947 the Budget Bureau has fixed 2,146,742 as the maximum permissible number. This leaves a long way to go to effect the cut to 1,600,000 which the Seventyninth Congress ordered to be made as of June 30, 1947. The chances are that it will not go anywhere near that figure.

Budget officials are in the middle of a study to determine the minimum number of employees required to do the government's essential work. They point out that the government does a great many things and that there is a limit to which the working force can be cut. While budget officials have not yet reached any final conclusions, it seems likely that the minimum number will be found somewhere "around 2 million" unless a good many existing government activities are tapered off.

New electrode simplifies tough-to-weld jobs

"Shield-Arc LH-70" is a new heavily coated electrode designed primarily for the welding of steels of poor weldability. Its as-welded properties are 75,000 to 80,000 lbs. per sq. inch and 25% to 30% elongation in 2". Stress relieved tensile strength is 70,000 lbs. per sq. in. minimum. Normally it produces a convex bead.



Welds made in high-sulphur steel. Left: Made with mild steel electrode. Right: Made with new "Shield-Arc LH-70" Electrode.

Typical Applications. Experience to date shows that this electrode produces exceptional results in these applications:

Low alloy high tensile steels which cannot be preheated.
High sulphur (free machining) steels.
High carbon, medium carbon steels.
High silicon electrical sheet steel.
For welds to be porcelain-enameled without annealing.

Procedure. Use DC—electrode positive, work negative. Hold a short arc. 1/8" and 5/32" may be used for vertical and overhead positions, single or multiple pass. Make vertical welds from bottom upward. Make overhead welds with stringer beads or narrow lateral weave.

CURRENT RANGE	
Rod Size	Amperes
1/8"	100—135
5/32"	140—190
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Butt welding medium carbon (.50% C) steel sprocket teeth forgings with the new Lincoln "Shield-Arc LH-70" Electrode.

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Combine Power, Accuracy and Speed

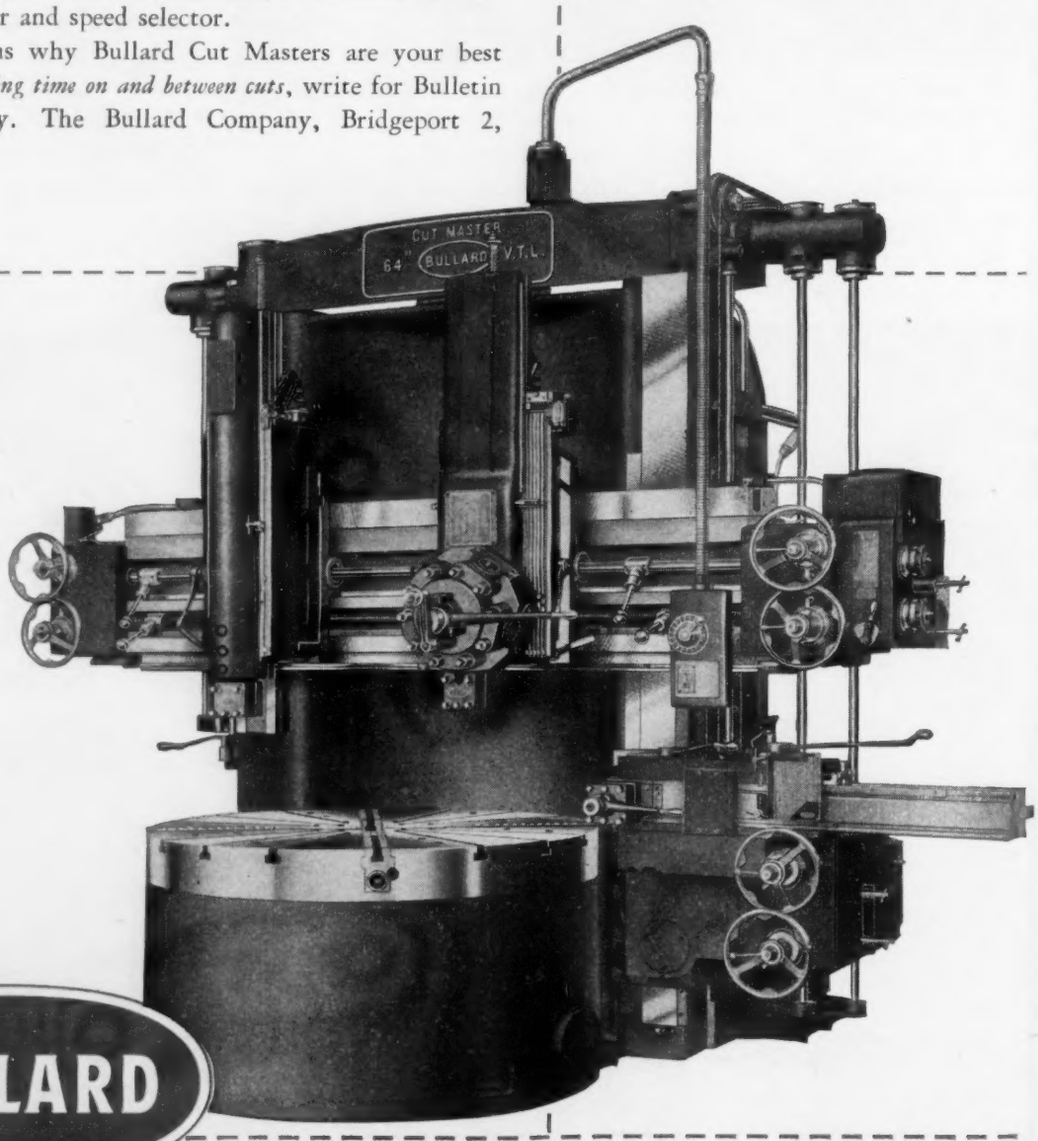
It has always been Bullard's policy to *create methods for cutting production time* instead of just building machines. That's why you'll find so many features of a volume-producing small machine in these massive, solidly constructed, highly accurate 64" and 74" Bullard Cut Master Vertical Turret Lathes.

There's extra speed in the smooth flow of power and the wide range of speeds and feeds that let you take advantage of the heaviest possible cuts with the newest carbide tools.

There are extra advantages in the hydraulically controlled limit switches which assure consistent duplication of dimensions, and speed up operations.

There is saving in operating time with the Bullard exclusive (patented) Pendant Control providing for clutch and brake, and instantaneous change in speeds by the simple operation of two-position finger lever and speed selector.

For other reasons why Bullard Cut Masters are your best investment for *cutting time on and between cuts*, write for Bulletin CVTL-4-1-46 today. The Bullard Company, Bridgeport 2, Connecticut.



Like the smaller 30", 36", 42" and 54" Cut Master Vertical Turret Lathes, these larger machines have the versatility that comes from 16 feeds for each head and 20 table speeds. The 64" size is made with a one-piece bed . . the 74" in four massive pieces . . . for the vibration-free rigidity that assures maintained accuracy.

BULLARD

CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

A little optimism, a little realism, a little worry over labor and materials, increasing cost consciousness and a lot of confidence in a sustained market—that's the automotive picture for 1947

Mirrors of Motordom

By A. H. ALLEN
Detroit Editor, STEEL

Frustrated by strikes, materials shortages, low labor productivity and other troubles in 1946, automakers have raised their sights again for 1947, hope to roll 5,000,000 cars and trucks from assembly lines

FIRST full year of postwar automobile production was one of high hope quickly developing into frustration and interruption which did not ease perceptibly until the last three months when a counterpart of prewar activity was achieved but at costs fantastically out of line from normal. Total output of passenger cars and trucks appeared destined for a figure of about 3,250,000 units—not a bad record when weighed against yearly totals for the past 15 years, having been exceeded only six times, yet still far short of the ambitious planning being drawn up in the fall of 1945. Considering passenger cars alone, the year saw about 2,250,000 built, compared with V-J day schedules which looked for 3,825,000 in 1946.

The reasons for the disappointing record are perhaps too well known to dwell upon at any length. Long strikes in the basic industries like steel, coal, glass, copper and electrical were root causes, and on top of them came protracted shutdowns in General Motors divisions and in hundreds of automotive parts plants which were reflected in impaired operations among other builders. It was not until July that most of these stoppages were cleared up, but their effects were still being felt at year-end when the sudden suspension of a disastrous coal strike averted what appeared like another extended tie-up to automobile output.

In an industry so vitally dependent upon sustained high-level output for profit, the stop-and-go record of 1946 had ruinous effect on profit possibilities. Price increases bringing automobiles to something like 50 per cent beyond their price level of 1939 only partially compensated for wage increases boosting hourly rates to 40-50 per cent beyond their 1939 position. Nonproductive or indirect labor costs were proving to be equally exorbitant and steps were being taken at year-end to whittle down such expenses in the realization that in 1947 companies will be operating "on their own money" so to speak, without the benefits of excess profits tax carrybacks, these being virtually the only source of black ink during the past year.

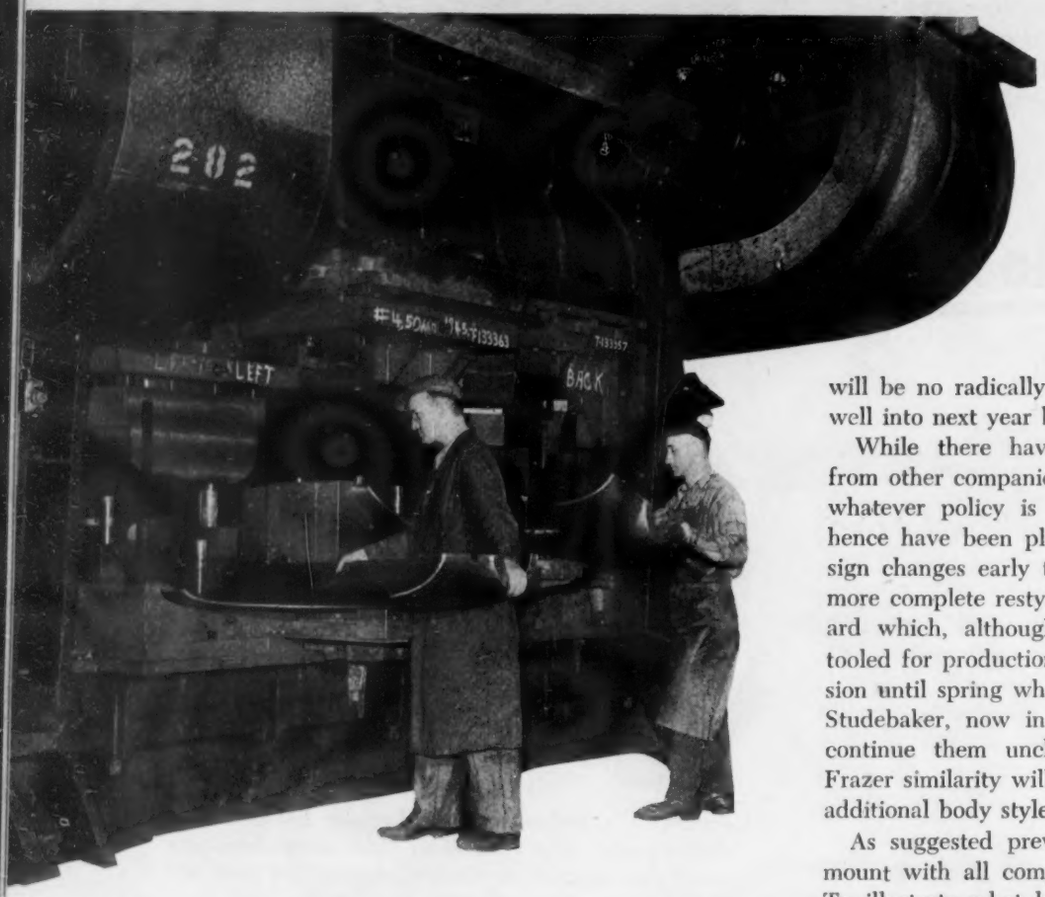
Two further factors contributed in some measure to reducing automobile losses. One was a high level of truck output, estimated to be almost 1 million units for the year or close to an all-time high. Adjustment of truck prices during the war permitted a better margin of profit, and unprecedented demand for the smaller commercial units absorbed everything the industry could produce. Current truck capacity for the industry is estimated at around 1,500,000 units annually, and some look for its realization this year.

The second favorable factor was a record high level of production of replacement parts. Almost without exception, the motor companies have been turning out parts in enormous volume and still find demand unsatisfied. As more new cars come into the field, parts output can be expected to taper; hence it would not appear likely this phase of the business would increase much during 1947.

What of the general outlook for this year? It best can be described as one of restrained optimism. Consensus is that limitations on overall supply of steel will prevent the automobile industry from doing much better than 4 million passenger cars and 1 million trucks. In fact, many plant expansion programs aimed at moving productive capacity beyond this level have been deferred because of apprehension over the basic materials situation.

Take this figure of 5 million cars and trucks and apply an average figure of 4000 pounds of steel as the gross unit requirement. This indicates a steel bill of 10 million net tons. Then if automobiles are allocated their historical share of around 15 per cent of total finished steel available, an annual total of 67 million tons of finished steel is implied, or pretty close to the top rating of the steel industry.

There are of course those in the steel industry who scoff at this pessimistic reasoning and who maintain stoutly there will be ample steel for as many automobiles as the industry wishes to build—and very shortly. Time will tell which version is correct. For the present, the automotive in-



Lowered productivity of automotive labor, estimated to be off 15 to 25 per cent from prewar levels, was a contributing factor to high costs in auto manufacturing. This press produces Buick front fender elements

dustry is setting its planning sights on a so-called "restricted" basis. Certainly, in support of the steel optimists it must be agreed that even in periods of top-level automobile output, it has not been possible long to support a steelmaking rate of better than 90 per cent, which has been in force the past six months.

If the 1947 goal is to be attained, it will mean an average weekly production of 100,000 cars and trucks, a figure not yet reached in postwar operations. Further, if the industry follows its normal pattern of model changeovers in the fall, a concentration of production in the first half of the year will be necessary. Thus, the four quarters of the year would have to show about the following record: January-March 1,300,000; April-June 1,600,000; July-September 1,000,000; and October-December, 1,100,000. This would allow for a gradual tapering of assemblies in August to permit retooling and a resumption of peak operations by early fall.

Just exactly what will be done on a model changeover was clouded early in December by announcement from General Motors of a suspension in 1948 model tooling programs for Chevrolet, Oldsmobile and Pontiac. It was not clear whether this announcement was temporary in character, touched off by the gloom of the coal strike, or whether it marked a sharp change in policy. Some rather elaborate plans had been drawn up for 1948 models in view of the relatively minor revisions being planned this month to distinguish the 1947 models. These programs involve major expenditures of both time and money—considerably more now than prewar—and if they are to be ready for assembly lines by fall, they cannot be delayed much further. Should they be definitely postponed, there will be no radically new models this fall, and it will be well into next year before the major changes come.

While there have been few official announcements from other companies, most are inclined to go along with whatever policy is determined by General Motors and hence have been planning to introduce a few minor design changes early this year and follow them up with a more complete restyling this fall. One exception is Packard which, although an entirely new model has been tooled for production, will continue with the present version until spring when the next series will be introduced. Studebaker, now in production with 1947 models, will continue them unchanged through this year. Kaiser-Frazer similarity will make no changes but will bring out additional body styles.

As suggested previously, the matter of costs is paramount with all companies in the auto-building industry. To illustrate what has happened, consider the following comparisons released recently by Ford:

Model	Materials	Labor	Overhead	Total	Man-hours
1941	$304	$76	$132	$512	87
1946	$456	$152	$354	$962	128

A smoother flow of materials, resulting in less work interruptions and less expense on follow-up has lowered the figure on the 1946 model somewhat from the time the above figures were compiled, but the disparity between the two models remains wide and this is the problem all producers are now tackling assiduously. Increases in wages and prices throughout all industry make it unlikely the 1941 cost can even be approached in the near-term future. The fear, however, is that another round of wage increases and the inevitable price increases will bring costs to the point where a manufacturer may have found himself priced out of his market. As long as the market exists, as it does today, this fear lies in the future, but no successful business can be operated without a weather eye to the future, whether it be 1947, 1948, or even 1949.

A major imponderable now, as it was even more so a year ago, is labor. The sudden capitulation a few weeks ago of John Lewis, together with the likelihood the new Congress will forthwith enact what is being described most generally as "equitable" labor union legislation, still does not remove the dangers of more strikes to win second-round wage increases. Philip Murray and his steelworkers are making menacing gestures already. The big auto unions either have started negotiations or indicate they will as soon as contract restrictions run out. It may

SPRINGFIELD MACHINE TOOL COMPANY

Uses

VICKERS HYDRAULIC CONTROLS

to achieve

- INCREASED PRODUCTION
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- SIMPLICITY OF INSTALLATION
- VERSATILITY OF OPERATION
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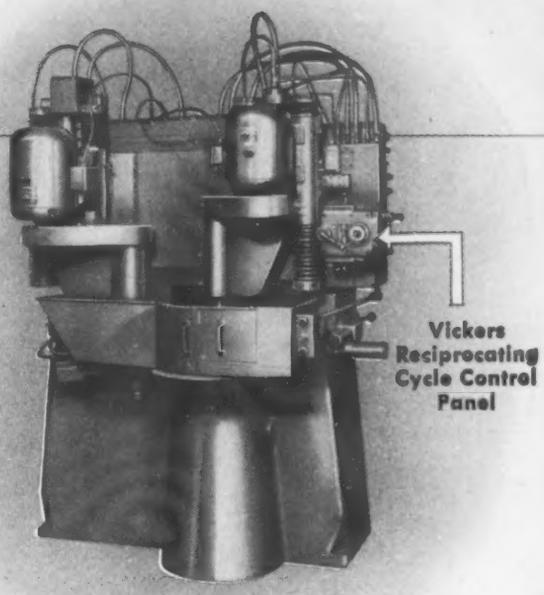

Springfield Special Purpose Grinder

The manufacturer has utilized Vickers Hydraulic Controls on this special purpose grinder to provide an important increase in production, better work finish, simpler operation, and protection for the operator, machine and work.

The machine grinds the backface and bore of the ring gear in one setup. Each grinding wheel is reciprocated hydraulically in proper sequence. All phases of machine cycle operation are interlocked hydraulically to prevent damage to work and machine.

Vickers Reciprocating Cycle Control Panel provides smooth reciprocation of grinding wheel, thus providing better finish. Stroke lengths are adjustable and maintained accurately thus eliminating unnecessary and time-consuming overtravel for a specific setup. Adjustable speed hydraulic drive of work spindle makes possible the best combination of speeds for better finish.

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A Vickers Application Engineer will be glad to discuss with you how hydraulic controls can be used to advantage on your products. Get in touch with nearest office listed below.

This is one of a series of applications pointing out the many advantages of Vickers Hydraulic Controls.

VICKERS
Incorporated
1480 OAKMAN BLVD.
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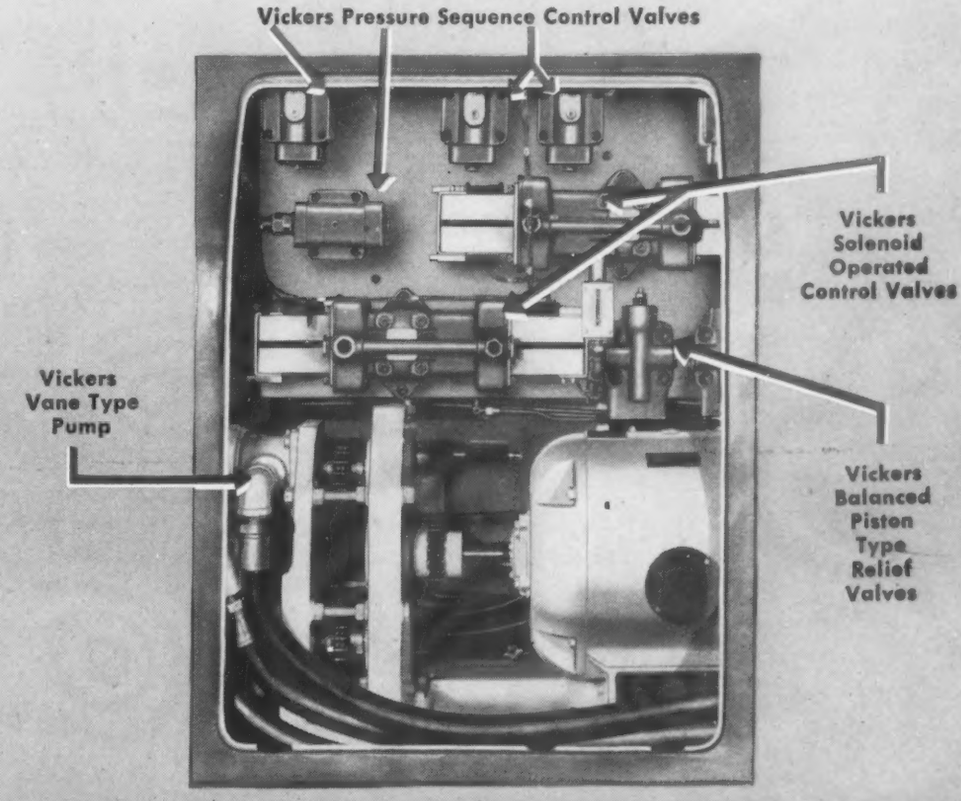
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921


Vickers Pressure Sequence Control Valves
Vickers Solenoid Operated Control Valves
Vickers Vane Type Pump
Vickers Balanced Piston Type Relief Valves

Rear View of Springfield Grinding Machine with Cover Plate Removed

Stainless Bars in Stock

Allegheny Quality — Ryerson Service

Contact Ryerson for prompt shipment of Allegheny Stainless bars. Diversified stocks and expert technical assistance in determining the type of stainless best suited to your needs are available at all twelve Ryerson plants.

Rounds, squares, hexagons, flats—whatever your stainless bar requirements, Ryerson is prepared to supply you with the analysis that will perform the best under any specified condition of service.

Successfully meeting the stainless requirements of industry for more than 20 years, our men are always ready to give you the benefit of their specialized experience. Whether your requirements are large or small, you will always receive prompt, personal attention.

Utilization of Ryerson's *complete* stainless stocks assures quick, dependable service. So, write, wire or phone your nearest Ryerson plant for prompt action on Allegheny Stainless bars.

Joseph T. Ryerson & Son, Inc. Steel-Service Plants: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles.

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RYERSON STEEL

be significant that several weeks of talks between Chrysler Corp. and the UAW-CIO were adjourned indefinitely in December. Contracts held with General Motors and Ford must carry through until spring before any further action. Beneath the present calm, however, is a simmering of union discontent over the fact its 18½-cent hourly increase in wages has been pretty well canceled out by corresponding increase in living costs, resulting naturally in the latest union proposals of sliding wage scales adjusted to the cost of living. The only trouble with these rosy dreams is that such scales would necessarily have to be constructed so they could move downward as well as upward, and *that* union leaders probably never could stomach.

So the problems of labor are by no means solved, even though at the moment they may appear quiescent. As disturbing to automobile executives as reports of more demands for wage rate boosts is the seeming inability of productivity to get back to its prewar level. Best estimates around Detroit late last year ran to the effect that individual effort was only 75-85 per cent of prewar. Many suppose this apparently deliberate decision of union labor to "take it easy" on the job can be traced directly to instructions from union leaders. Undoubtedly in some cases it can, but there are other important contributing factors. One is the interrupted flow of materials and parts to manufacturing and assembly departments. A second might be the unfortunate overstaffing of working forces in anticipation of a production level which was never achieved. A third may spring from the large numbers of inexperienced help in automotive plants. A fourth may be attributed to the high percentage of veterans employed, many of whom still suffer from real or fancied neurosis tending to dissuade the afflicted from intensive production effort and to make for high labor turnover rates. On top of all is the postwar unsettlement which has gripped most persons, including managements, and which 16 months' time has not erased.

The brutal prescription for restoring productivity among working forces is "a little unemployment" which would lead to a competition for jobs, in contrast to the competition for employees which has been the rule since 1941. A better way, heartily endorsed by all who subscribe to the principles of full employment, would be the more widespread acceptance of incentive pay systems, more or less outlawed by labor unions since 1937.

Animosity of unions, particularly the CIO, toward arrangements which provide more pay for more work is deep rooted and does not appear likely to change in the near future. Witness the recent statement of Richard T. Leonard, vice president of the UAW-CIO: "The UAW does not accept or support any attempt to increase productivity through the intensification of the already adequate physical effort by workers employed in UAW plants. In general we are convinced that the average automobile worker has been giving more than adequate physical effort on his job. We are solidly opposed to any attempt by management to increase the physical demands upon the average worker. Only where it can be established that particular workers have failed to meet objective fair standards of effort will the union recognize management's right to demand more; and this, of course, must be subject to the operations of established collective bargaining procedures and grievance machinery."

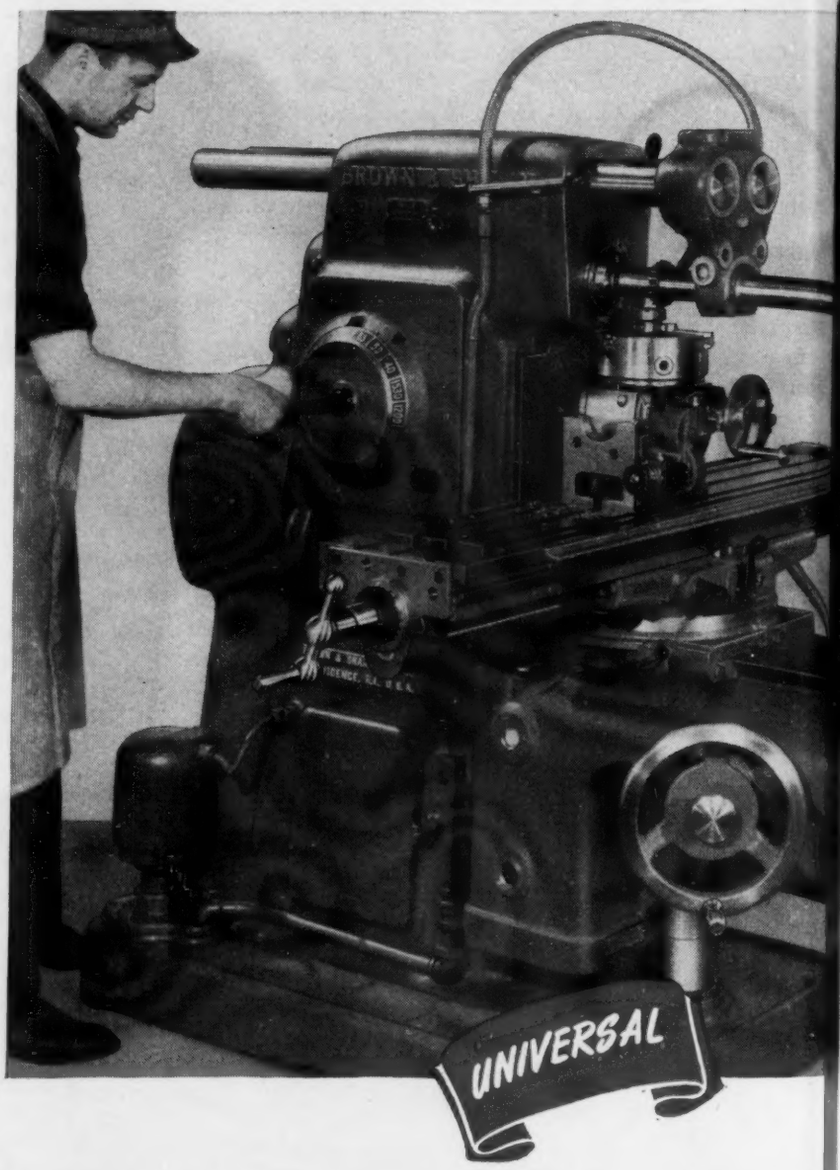
Few managements will agree the average automobile

(*Please turn to Page* 198)

Striking air view of the Packard Motor Car Co. plant in east central Detroit which, with its wartime additions in foreground, represents more manufacturing space than the famed Willow Run. The plant is nearly a mile in length. Idle aircraft engine testing cells are to the right

In these Light Type Milling Machines --- *All the features for efficient production in toolroom and shop*

BROWN & SHARPE designed these moderate weight, sensitive machines for rapid, easy set-up and handling. Yet they are proportioned to insure more than adequate rigidity and to hold their original accuracy through a long, economical life. They have the "feel" that satisfies every instinct of a good machinist. Such features give the purchaser, over the years, the largest possible return on a sound investment. These and other production advantages . . . needed more today than ever before . . . are fully illustrated and completely described in separate specifications for each of the No. 2 Universal, No. 2 Plain, and No. 2 Vertical Light Type Milling Machines. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



CONTROLS, naturally positioned . . . fatigue preventing . . . time saving. *Where the operator would naturally expect to find each control, that's exactly where it is on these machines. Controls are grouped for convenient reach and normal hand and arm movements at the front.*

AMPLE RANGES OF SPEEDS AND FEEDS, quickly, easily selected. *Speeds and feeds are each selected by rotating a single lever, one turn in either direction, giving a change in rate. Large, easily read figures on dials indicate rates available. Easy for operator to select most productive rate.*

BROWN &

SET-BACK FACE OF COLUMN provides greater rigidity of cutter support. *Of distinct advantage on the Universal and Plain Machine is the set-back column which permits the cutter to be mounted closer to the spindle nose and allows the use of shorter arbors – a condition essential to maximum cutter rigidity under working loads.*

AUTOMATIC LUBRICATION. *Throughout the column, knee and table, all driving mechanisms and ways have complete automatic lubrication. This saves the operator's time and greatly prolongs the life of the machine.*

SHARPE

B·S

J·E·

(*Continued from Page* 195)

worker has been giving "more than adequate" physical effort to his job. At the same time, they are at a loss to know how to sell to their employees the economic advantages of properly designed incentive systems, let alone how to develop workable systems in the large integrated plants.

An interesting development last year, which quickly demonstrated its effectiveness, both in improving productivity and boosting earnings, was the so-called "cost saving sharing" plan instituted by Bundy Tubing Co. Admittedly the plan could not be transplanted immediately to the average automobile production line, still it suggests a pattern which might have possibilities. Essentially the plan involves determination of the percentage of monthly net product sales represented by hourly wages over a preselected base period; then as monthly sales increase from the base figure, the percentage (roughly 30) accountable to wages is applied, total wages paid deducted, and the balance divided equally between the company and the employees. Each employee, no matter what his base rate, is paid the same bonus, in accordance with the number of hours he or she worked. Bonuses are accumulated over a three-month period and paid at the end.

Many favorable effects were directly attributable to the bonus plan. Absenteeism declined 35 per cent; scrap decreased 7 per cent; efficiency improved about 35 per cent, not because of any extra exertion on the part of employees but rather because of a reduction in loafing and in general unnecessary idle time. Employee morale improved with earnings under the bonus plan which, incidentally, was approved by the UAW, probably for two principal reasons—it was the only way to get an idle plant back into production, and it was not called an incentive system, paying off equally to all employees.

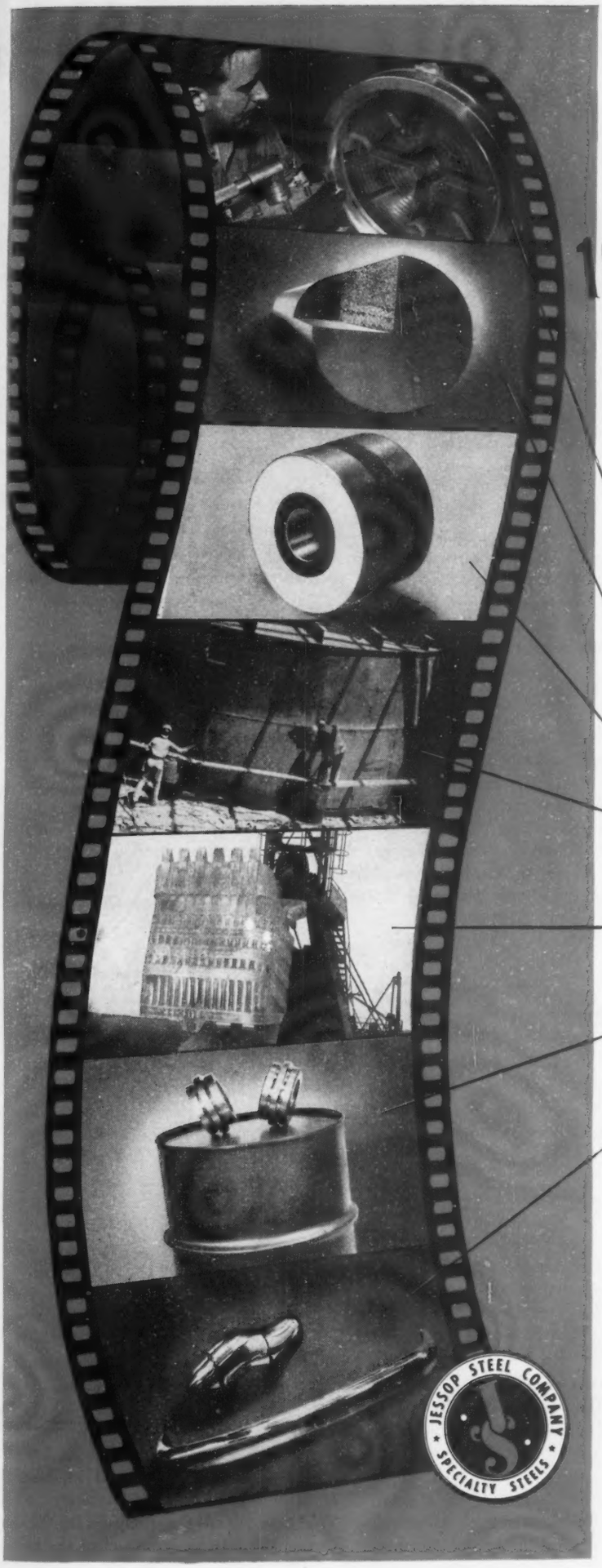
Reforms in labor laws appear imminent. What they should embody probably will involve long debate. Seven admirable suggestions were contained in remarks made last month in Chicago by C. E. Wilson, president of General Motors. He advocated that new laws and procedures and the administration of them should be consistent with the following principles:

1. They must be economically sound. The effort to find political shortcuts to prosperity without work must be abandoned.
2. They must be ethically and socially sound.
3. They must be practical and understandable.
4. They must be legally sound and enforceable.
5. They must recognize the principle that we can all have more only if we produce more. They must reward industry and thrift and recognize that laziness and dissipation must pay their penalties.
6. They must recognize that the right to work—to compete for a job and earn a living—is superior to the privilege to striking.
7. They must recognize that labor monopolies, just as any other form of business monopoly, are intolerable in a free society and must be regulated by the government or prohibited.

A few specifics are prescribed for labor law modifiers by Mr. Wilson: Industry-wide bargaining should be prohibited, as should compulsory unionism; unions must be subject to the same laws regulating group and personal conduct that apply to other groups and all other citizens; laws governing collective bargaining must be clarified to define what it is and what are its limits; strikes over jurisdictional disputes, sympathy strikes and all forms of boycott should be outlawed.

Nearly as critical as the labor problem in the eyes of most auto executives, is the fiscal problem, involving not only a mountainous federal debt, now practically the equivalent of a 100 per cent mortgage on the nation's productive machine, but also such related factors as increased working capital requirements resulting from seriously unbalanced inventories, and increased fixed capital required by the sharply higher costs of tools, plants and facilities, and a major increase in fixed overhead expenses due to these higher costs. (*Please turn to Page* 381)

An estimated 650,000 military jeeps were built during the war and 400,000 still roam the remote areas of the world. At home, the jeep has been adapted to the farm to perform dozens of hauling and cultivating tasks



THE JESSOP 1946 NEWSREEL

A record of continuous Achievement

1. Special tool carbide developed for turning hard non-ferrous cast alloy die insert (61 Rockwell C) with 60% savings in production time.

2. "Vee-Oginizing", a new method of forging large-diameter high alloy tool steel rounds which assures a more uniform cross sectional carbide distribution.

3. "Malta" carbide inserted compacting dies. One side of one die produced over 5,300,000 pharmaceutical tablets with no sign of wear.

4. 700 tons of stainless-clad steel supplied for the fabrication of 44 huge storage tanks for Welch Grape-Juice Company. Total capacity: 6,500,000 gallons.

5. E-9 high tensile steel for liner plates, skid runner bars and runner plates on world's largest shovel dipper (40 cu. yd.), built by Marion Power Shovel Company for Hanna Coal Company.

6. Cast-to-shape tool steel for the metal working industry. The two 3-C Special cast-to-shape seaming rolls illustrated seamed 1,820,000 barrel covers each with only one grind per roll.

7. Stainless-clad steel for automobile bumpers and other accessories will not rust, flake, peal or deteriorate, and it maintains a lustrous surface during life of vehicle. Stainless-clad bumper and bumper guard are illustrated.

The illustrations above show only a small portion of how JESSOP'S research and "know how" have aided all industry. Consult JESSOP on your special problems in design, fabrication, and production. Literature on request.

JESSOP STEEL COMPANY

Washington, Pennsylvania

Tailor-made Specialty Steels

Men of Industry

WILLIAM H. TAYLOR

GERHARDT BARTZ

EDWARD A. SIPP

William H. Taylor has been appointed manager of the newly organized Philadelphia district, Spang-Chalfant Division, National Supply Co., Pittsburgh. The division's sub office in Philadelphia, which was a part of the New York district, has been reorganized as a complete Philadelphia district office. The district covers eastern Pennsylvania, Maryland, Delaware, southern New Jersey, Washington, Virginia and eastern North Carolina. Mr. Taylor has been in the Philadelphia office since transferring from Boston 4 years ago.

—o—

Arthur F. Peterson has been appointed general manager, raw materials properties, Bethlehem Steel Co., Bethlehem, Pa. **Sheldon J. Shale** has been named manager of the company's Cornwall Ore Division, succeeding Mr. Peterson. For the last 2 years. Mr. Shale had been superintendent of the firm's ore concentrator plant in Lebanon, Pa. Mr. Peterson joined Bethlehem in 1924, when he became superintendent of Cornwall mines. Prior to that, he was with Pickands Mather & Co., Cleveland, and was stationed in the Michigan ore fields. Mr. Shale joined Bethlehem Steel in 1936. Upon completion of the company's loop course, he was assigned to the mechanical department at the concentrator plant. He advanced to assistant superintendent, and 2 years ago was named superintendent of the plant.

—o—

Wilfred Sykes, president, Inland Steel Co., Chicago, has been nominated for president, Chicago Association of Commerce. **Edward K. Welles,** president and treasurer, Charles H. Besly & Co., Chicago, has been nominated for general secretary of the association. **C. J. Whipple,** president, Hibbard, Spencer, Bartlett & Co., Chicago, has been nominated to continue as vice president for transportation, and **Fred T. Whiting,** vice president, Westinghouse Electric Corp., Pittsburgh, as vice president for industrial development. Election will be held Jan. 8, and inauguration at the association's annual meeting on Jan. 22.

—o—

Gerhardt Bartz has been appointed works manager, Bellevue Industrial Furnace Co., Detroit. Mr. Bartz had been assistant plant engineer, Dodge Forge Division, Chrysler Corp., Detroit. He had been with Chrysler Corp. for more than 17 years. Prior to that, he had held engineering positions with Western Electric Co., New York; Continental Motors Corp., Muskegon, Mich.; and Paasche Air Brush Co., Chicago.

—o—

E. J. Schwanhauss r, vice president, Worthington Pump & Machinery Corp., East Harrison, N. J., has been re-elected president of Diesel Engine Manufacturers Association, Chicago. Also returned to their posts as vice presidents of the association are **J. E. Peterson,** vice president, General Machinery Corp., Boston, and **Gordon Lefebvre,** president, Cooper-Bessemer Corp., Mt. Vernon, O. **Robert H. Morse Jr.,** vice president and general sales manager, Fairbanks, Morse & Co., has been re-elected treasurer. **Harvey T. Hill** has been reappointed executive director of the association.

—o—

Morris Evans Leeds, founder and chairman of the board, Leeds & Northrup Co., Philadelphia, has received the ASME Medal, highest honor of the American Society of Mechanical Engineers, for his achievements in the invention and development of electrical and temperature measuring instruments, and in the field of industrial relations. The medal was presented by D. Robert Yarnall, ASME president, at the society's annual banquet in New York.

—o—

Edward A. Sipp has been appointed manager, Railway Division, Chicago, Reynolds Metals Co., Louisville. Prior to joining the Reynolds company last July, Mr. Sipp was with Gustin-Bacon Mfg. Co., Kansas City, Mo., as contact executive. His work with that firm consisted of engineering and sales promotion in the heavy industries, particularly railroads, machinery and aircraft.

—o—

William M. Hufnagel has been appointed district sales manager, in charge of the new Milwaukee sales office, Link-Belt Co., Chicago. He will be assisted by **H. B. Johnson** and **F. E. Sweeney.** A portion of the territory falling within the scope of the new office has been served by Mr. Hufnagel for a number of years from the company's Pershing Road plant in Chicago. Mr. Hufnagel started his Link-Belt career in 1924, when he became a summertime employee at the Ewart plant in Indianapolis. In 1927, he joined the company as a permanent employee, as a draftsman in the engineering department of the Ewart plant. In 1935, he was transferred to the Link-Belt Dodge plant in Indianapolis, and in 1936 he joined the positive drive sales department in Chicago. Since 1943, he had been serving as district sales manager in Chicago for the company.

—o—

Ray E. Valentine has been appointed assistant district sales manager, St. Louis railway sales office, National Malleable & Steel Castings Co., Cleveland. Mr. Valentine joined the company in 1913. During the war, he was chief of the mal-

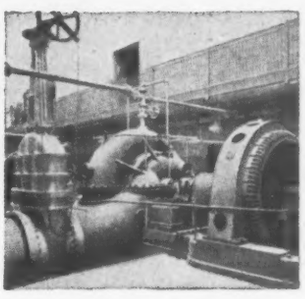
INDUSTRY BANS RUST AND CORROSION
with EVERLASTING FASTENINGS

Few industries can escape the destructive effects of rust and corrosion but *all* industries can reduce their costly ravages in maintenance and breakdown.

Here are six industrial applications where Harper's EVERLASTING FASTENINGS have licked rust and corrosion.

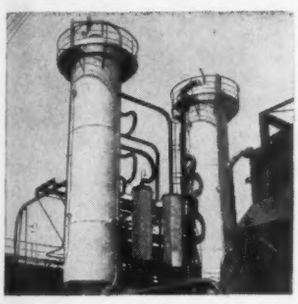
MONEL STOPS CORROSIVE CHEMICALS

Problems in salt production have been solved by using Monel bolts. In mining, treating and handling of many chemicals, non-ferrous alloys are the answer to efficient operation.



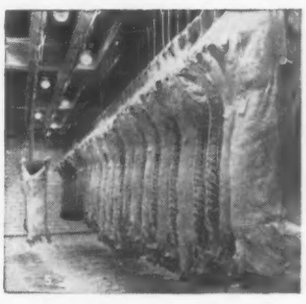
BRASS GUARDS WATER SYSTEMS

In valves and pumps that compose the heart of water works, Brass fastenings help in eliminating the most common cause of replacement—rust.



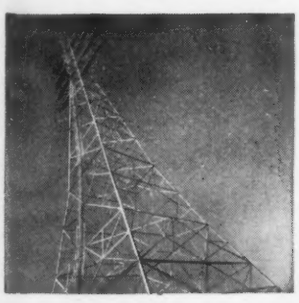
STAINLESS STEEL SOLVES OIL PROBLEMS

Acids and gases at high temperatures attack metal but Stainless Steel alloys cut refinery replacements to a minimum, assure years of continued operation.



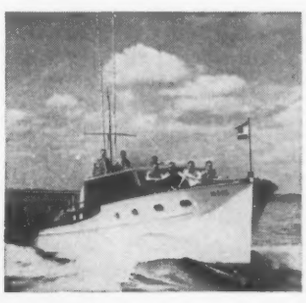
STAINLESS STEEL KEEPS FOOD PURE

Food handling and processing offer many corrosive environments to common steel. Stainless Steel or Monel metal fastenings belong where cleanliness is paramount.



UTILITIES CHOOSE SILICON BRONZE

Weather is the bug-a-boo in power lines and other utility applications. Silicon Bronze Bolts reduce season "cracking" and maintenance costs.



NAVAL BRONZE WINS ON THE SEA

Marine applications demand high strength plus resistance to salt air and water. Naval Bronze fastenings have proved their dependability in marine diesels and ship fittings.

If you have rust or corrosion problems in your industry, it will pay you to use Everlasting Fastenings. Consult Harper engineers or order any of more than 4850 types and sizes of standard fastenings carried in stock.

Branch offices: New York City • Philadelphia • Los Angeles • Milwaukee • Cincinnati • Dallas

Representatives in Principal Cities

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leable iron section, forging and castings branch, War Production Board. He returned to the company in 1945 as St. Louis railway sales agent. **John R. Kingman** has been appointed to succeed Mr. Valentine as sales agent. Mr. Kingman joined the engineering department of National Malleable in Cleveland a year ago, and was transferred to the St. Louis office as field engineer. He served in the Army during the war.

—o—

George A. Collin has been appointed to the recently created position of controller, H. K. Ferguson Co., Cleveland. For the last 8 years, Mr. Collin has been with the Bureau of Internal Revenue. He spent 5 of those years as a special agent in the bureau's intelligence unit.

—o—

C. M. Mohr has been appointed manager, Freedom Division, Freedom-Valvoline Oil Co., Freedom, Pa. The division serves the company's tri-state area, consisting of sections of Pennsylvania, Ohio and West Virginia. For the last 3 years, Mr. Mohr has devoted his time to sales-service work among dealers throughout the Freedom Division. In his new position, he will continue as much of that work as possible.

—o—

J. D. Connor has been named district manager at St. Louis, Superior Engine Division, National Supply Co., Pittsburgh. Mr. Connor joined National Supply in 1935. During the war, he was chief of the Heavy Duty Diesel Engine School, Camp Gordon Johnston, Fla. He returned to inactive status last spring.

—o—

John A. Payne, president, Consolidated Coppermines Corp., New York, has been elected chairman of the board of Titan Metal Mfg. Co., Bellefonte, Pa. Consolidated recently acquired a controlling interest in the Titan company. New directors elected to the board are **Chester D. Tripp**, who is also a director of Consolidated Coppermines, and **E. Norman Hickman**, vice president, American Metal Co. Ltd., New York. Mr. Payne is also a director of the following companies: Autocar Co., Ardmore, Pa.; Liberty Aircraft Products Corp., Farmingdale, L. I., N. Y.; Highway Trailer Co., Edgerton, Wis.; and Roberts Numbering Machine Co., Brooklyn, N. Y.

—o—

A. Robert Noll has been appointed manager, patent department, International Business Machines Corp., New York. Mr. Noll has been a member of the IBM patent department staff since 1933.

—o—

Dr. Bennett S. Ellefson, director, Central Engineering Laboratories of Sylvania Electric Products Inc., Bayside, N. Y., is now in Germany, serving as a scientific consultant for the Technical Industrial Investigating Division, United States Department of Commerce. He is scheduled to visit German synthetic mica plants and laboratories for an investigation of wartime developments. Dr. Ellefson also expects to investigate several laboratories and plants producing fluorescing chemical compounds for cathode ray tubes, a field in which he holds several domestic patents. During his work in Germany, he will report directly to the Technical Industrial Investigating Division of the Department of Commerce, by whom his investigations will be documented for public information. He expects to return to the United States early in 1947.

—o—

R. L. Coe, Chase Brass & Copper Co. Inc., Waterbury, Conn., has been elected president of the Copper & Brass Research Association, New York. The following men have been elected vice presidents of the association: **William M. Goss**, Scovill Mfg. Co., Waterbury, Conn.; **H. W. Steinkrauss**, Bridgeport Brass Co., Bridgeport, Conn.; **J. P. Lally**, C. G. Hussey & Co., Pittsburgh; and **A. G. Wheeler**, Seymour Mfg. Co., Seymour, Conn. Donald **Dallas**, Revere Copper & Brass Inc., New York, has been elected treasurer of the association. **T. E. Veltfort** has been elected manager, and **Bertram B. Caddle**, secretary.

—o—

Harry Goldberg, Goldberg Iron & Steel Co., Columbus, O., has been re-elected president of the Cincinnati chapter, Institute of Scrap Iron & Steel Inc. **Ben Schottenfels**, David J. Joseph Co., Cincinnati, has been elected vice president of the chapter, and **Roy Adams**, Freedman & Adams, Norwood, O., has been elected secretary-treasurer.

—o—

Louis R. Caplan, recently released from the Army, has returned to his post as Washington representative for Hagan Corp., Pittsburgh, and subsidiary, Calgon Inc. During his absence, his position was filled by **George H. Larkin**, who has now been placed in charge of the company's Cincinnati office. In 1937, Mr. Caplan joined Ash Engineering Co., Philadelphia, Hagan representatives, as sales engineer. He joined the Army in January, 1944.

—o—

R. H. Money, refrigeration advisor to **W. G. Reynolds**, vice president, Parts Division, Reynolds Metals Co., Louisville, has been elected president of American Society of Refrigeration Engineers. Mr. Money was vice president of the society during 1945-46, and was active in forming a section of ASRE in Cincinnati, where he was chief engineer for Crosley Corp. He served as first chairman of this group. In the national or-

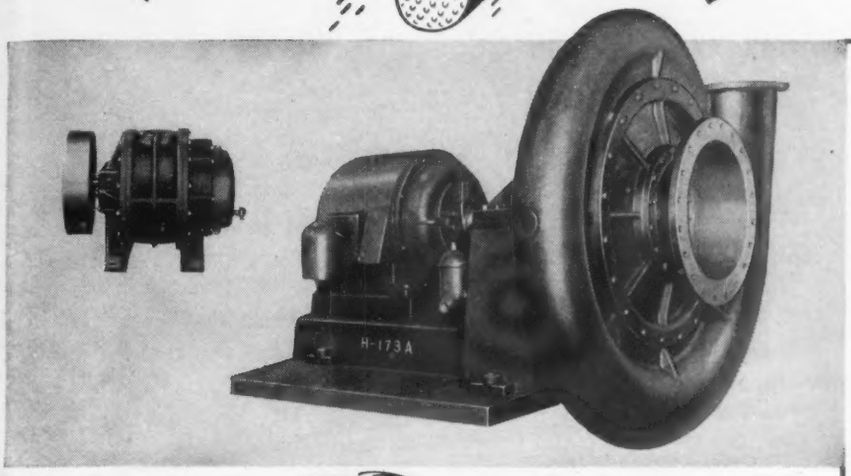
(*Please turn to Page* 205)

J. D. CONNOR

DR. BENNETT S. ELLEFSON

LOUIS R. CAPLAN

A THIMBLE OF AIR...



OR A HURRICANE!

From our wide range of sizes and capacities, you can select a Roots-Connersville Blower to deliver nearly any quantity of air for practically any industrial process.

For instance, our Rotary Positive units are widely used in separate or built-in applications where a small amount of air is required. For large volumes, you have the choice between Rotary Positive and Centrifugal Blowers, depending upon your specific requirements.

R-C *dual-ability* to supply either Rotary or Centrifugal Blowers offers important advantages to users. Because we design and build both types, we can be completely unprejudiced in our recommendations. This *dual-ability* frequently results in substantial savings in first cost and operating and maintenance expense.

Whatever your requirements may be, whether to move air or gas, ask R-C *dual-ability* for the answer. You'll be sure of the right unit to suit your needs, for long years of profitable performance.

ROOTS-CONNERSVILLE BLOWER CORPORATION
701 Steelton Avenue, Connersville, Indiana

ROOTS-CONNERSVILLE
ROTARY CENTRIFUGAL
BLOWER BUILDERS R-C SINCE 1854
BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★

IF YOU MOVE AIR, GAS OR LIQUIDS IN YOUR BUSINESS, CALL ON *R-C dual-ability!*

These samples of work done by R-C Rotary Positive or Centrifugal units may suggest ways in which you can increase or improve production, or cut costs. Send for details on coupon below or write us about your problems.

Metal working: Air for cupolas, blast furnaces and other combustion processes; gas exhausters; air for drying ovens and annealing processes; gas exhausters and boosters.

Chemical processes: Blowers or exhausters for supplying or removing gas or air; for filtering, aeration or agitation of liquids; meters for measuring gas or liquids.

Mining: Air for ventilation; rock dust removal during drilling; flotation processes; smelters; coal treatment and washing.

Paper making: Vacuum pumps for suction rolls, flat boxes and felt conditioners; filter pumps; gas exhausters and boosters, pneumatic conveying.

Food production: Blowers for pneumatic conveying; gas boosters; heat processing, removal of waste or by-products.

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Please send more information on:

BLOWERS_____ EXHAUSTERS_____
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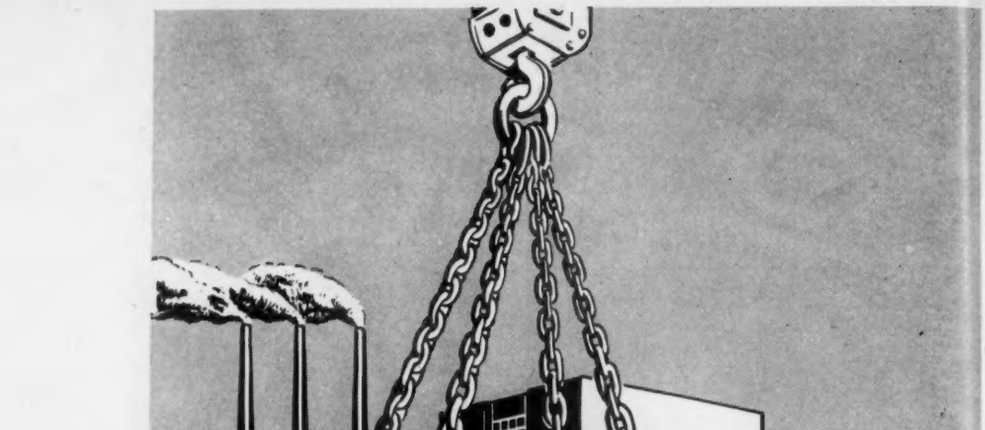
BOOSTERS_____ INERT GAS GENERATORS_____

NAME_____

TITLE_____



Put yourself in his shoes—*safely*

Five tons of steel overhead . . . a wife and three children at home. It's a familiar scene every day in many plants.

But are you providing as much protection for the man below as you would want—*in his shoes?*

When sling chains are Cleveland made, you know there's absolute protection against sudden breakage. For Cleveland Sterling Grade Sling Chains are hand forged by craftsmen from double refined, puddled wrought iron.

Every Cleveland chain passes rigid tests before shipment. The certificate of test with each chain says *dependability*. It's your assurance of proved resistance to shock loads.

Next time you order sling chains, specify Cleveland Sterling Grade. And remember—National Safety authorities give this chain *the highest margin of safety rating.* P & P—5000

A STYLE FOR ANY TYPE OF HEAVY DUTY LIFTING

- Cleveland Sterling Grade Sling Chains are available with single ... double ... 3-way or 4-way slings.

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ganization, he served as chairman of the general technical committee and membership committee. Mr. Money was with Crosley Corp. for 15 years, and left in 1946 to join Reynolds Metals Co. to aid in forming the new Refrigeration Division of that company.

—o—

Ronald Vingoe, recently released from the Army, has joined the staff of Battelle Memorial Institute, Columbus, O., where he will be engaged in research in steel processing.

—o—

Leonard H. Krieger, Southwest Steel Corp., Pittsburgh, has been elected president for 1947, Pittsburgh chapter, Institute of Scrap Iron and Steel. Other officers elected are: Vice president, **Herman Caplan,** M. W. Singer & Co., Pittsburgh; secretary, **Samuel W. Goldberg,** Pennsylvania Iron & Steel Co., Pittsburgh; and treasurer, **Robert M. Jacobson,** Luria Bros. & Co. Inc., Pittsburgh. **Edward Fields,** Edward Fields & Co., Morgantown, W. Va., has been elected chairman of the executive committee of the chapter.

—o—

M. L. Godman has been promoted to associate deputy administrator, Office of Aircraft Disposal, War Assets Administration. He had been director of the Depot Clearance Division, Office of Aircraft Disposal, War Assets Administration. He joined WAA in October, 1945.

—o—

Stephen M. Shelton has been appointed chief, Albany, Oreg., Division, Bureau of Mines. He will have charge of research in zirconium, carbothermic magnesium, iron-phosphate ores, iron-nickel ores, electrolytic zinc, and nonmetallic minerals. Mr. Shelton had been with the bureau's Foreign Minerals Division, and worked closely with the State Department on Latin American mineral projects.

—o—

Lee C. Daniels has been appointed chief engineer, Towmotor Corp., Cleveland. Previously, he had been with Oliver Corp., Cleveland; Cleveland Tractor Co., Cleveland; Twin Coach Co., Kent, O.; and White Motor Co., Cleveland.

—o—

Youngstown Sheet & Tube Co. announces five appointments, effective Jan. 1, in its Youngstown district. **B. M. Stubblefield** has been appointed general superintendent, Campbell works steel plant, blast furnaces and Struthers works. He had been assistant general superintendent of the Campbell works. **J. S. Stanier** has been appointed general superintendent of flat rolled and tubular mills at the Campbell works. He had been superintendent of the hot and cold strip mills. **W. H. Yeckley** has been named general superintendent at Brier Hill. He was superintendent of the Brier Hill works. **C. J. Daley,** who was assistant superintendent of the sheet and cold strip mill, has been appointed superintendent of the cold strip mill. **J. E. Finnie** has been named superintendent of the hot strip mill. He had been assistant superintendent of that unit.

—o—

Barton I. Hogarth has been named to the newly created position of purchase engineer, Equipment & Supplies Division, purchasing department, Pennsylvania Salt Mfg. Co., Philadelphia. His work will be in the field of equipment and accessories. Mr. Hogarth had been with the Manhattan District Project. Prior to that, he was with Carbide & Carbon Chemicals Corp., New York, in the South Charleston, W. Va., and Texas City, Tex., plants.

—o—

Fred K. Landgraf Jr. has joined the Research Laboratory of **Carl A. Zapffe,** Baltimore, as research metallurgist investigating special problems. Mr. Landgraf spent 1 year in production research with Vanadium Corp. of America, New York, and 2 years in the Research Laboratory of Lebanon Steel Foundry, Lebanon, Pa., before enlisting in the Army.

—o—

Harold Weinstein, Calumet Iron & Supply Co., East Chicago, Ind., has been reelected president of the Chicago chapter, Institute of Scrap Iron & Steel Inc. Others returned to office are: **Frank Grossman,** Grossman Bros. Co., Milwaukee, first vice president; **Henry Rosenthal,** Briggs & Turivas, Blue Island, Ill., treasurer; **Harvey Kaplan,** M. S. Kaplan Co., Chicago, secretary; and **William Pohn,** Pohn Iron & Metal Co., Chicago, chairman of the executive committee.

FRED K. LANDGRAF JR.

A. J. Clonick, Clonick Steel Co., Chicago, has been advanced from third to second vice president of the chapter, and **E. R. Mitchell,** Chicago Metals Co., has been named third vice president.

—o—

Howard Kellogg Jr. has been elected president, Spencer Kellogg & Sons Inc., Buffalo, succeeding his father, **Howard Kellogg Sr.,** who has been named chairman of the board. **Dr. Alexander Schwarcman** and **Theodore C. Jewett,** directors, have been elected vice presidents of the company. Dr. Schwarcman will continue in charge of research, while Mr. Jewett will remain in charge of production.

—o—

Carl F. Dietz, president, Lamson Corp., Syracuse, N. Y., has been elected president of the Manufacturers Association of Syracuse, N. Y., for the 1946-1947 term. **H. Follett Hodgkins,** president, Lipe-Rollway Corp., Syracuse, has been elected chairman of the board of the association. **H. Paul Nelligan,** president, Easy Washing Machine Corp., Syracuse, and **DeAlton J. Ridings,** vice president and general manager, Porter-Cable Machine Co., Syracuse, have been elected vice presidents of the organization. **F. Ware Clary,** Crouse-Hinds Co., Syracuse, has been elected treasurer of the association, and **Forrest E. McGuire,** executive vice president.

—o—

Oscar Frohman has been appointed general sales engineer, Ampco Metal Inc., Milwaukee. Mr. Frohman had been manager of market development for the company, and will continue to carry out such work as is necessary in that capacity. **James Arter,** who was general sales engineer, has been appointed assistant to the general manager.

—o—

Lee Treese has been appointed vice president in charge of manufacturing, Tucker Corp., Chicago. He was production superintendent, Ford Motor Co., Dearborn, Mich., prior to joining Tucker. He has been supervising work on pilot models for Tucker Corp., and is working on plans for setting up production and assembly lines and retooling the 475 acre plant which Tucker now occupies under a 10 year lease agreement with the War Assets Administration.

—o—

James R. Newman has resigned as chief of the Science Division, Office of War Mobilization & Reconversion. Mr. Newman, who had been a member of the OWMR staff since May, 1945, served for 10 months as counsel for the Senate Committee on Atomic Energy. He was awarded a Guggenheim Fellowship this

(*Please turn to Page* 208)

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A Complete line of PRESSES

WELDED STEEL CONSTRUCTION

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- Two-Point Eccentric-Gear Models
- Straight-Sided Hydraulic Models
- Mechanical Press Brakes

All weldments are fully stress-relieved to provide maximum

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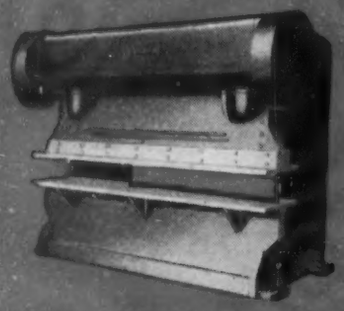
ENDURANCE • ACCURACY

PRESS BRAKE
Capacity range, 100 to 500 tons. Handles lengths up to 24 feet and longer.



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This organization can, also, render a complete service in designing, engineering and building presses to meet your specific requirements.

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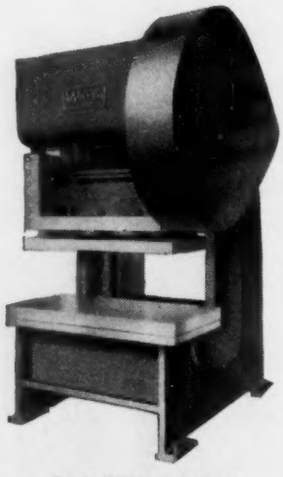
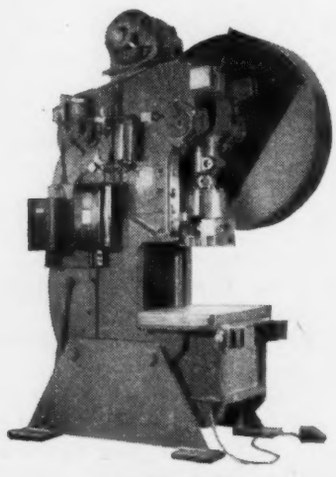
Offices in Principal Cities

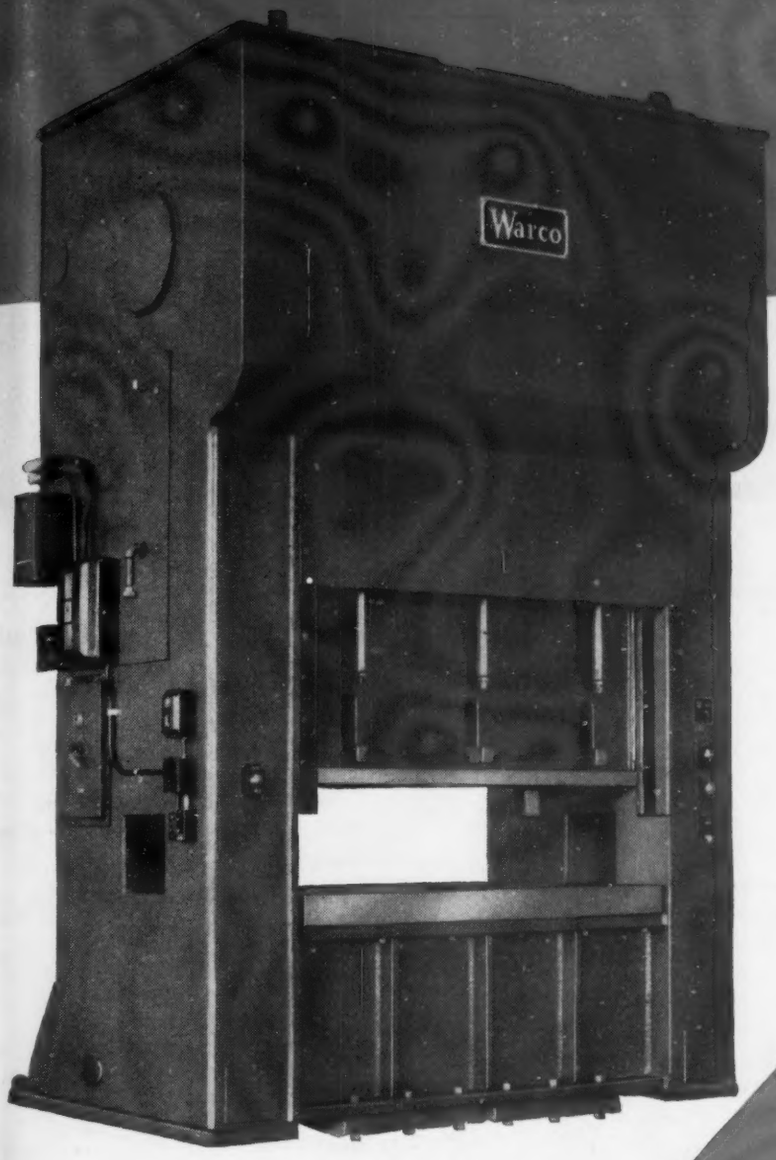
STRAIGHT-SIDED DOUBLE-CRANK GAP PRESS
Capacity range, 100 to 500 tons



GAP TYPE DOUBLE CRANK PRESS
(Single Geared)
Capacity range, 100 to 500 tons.

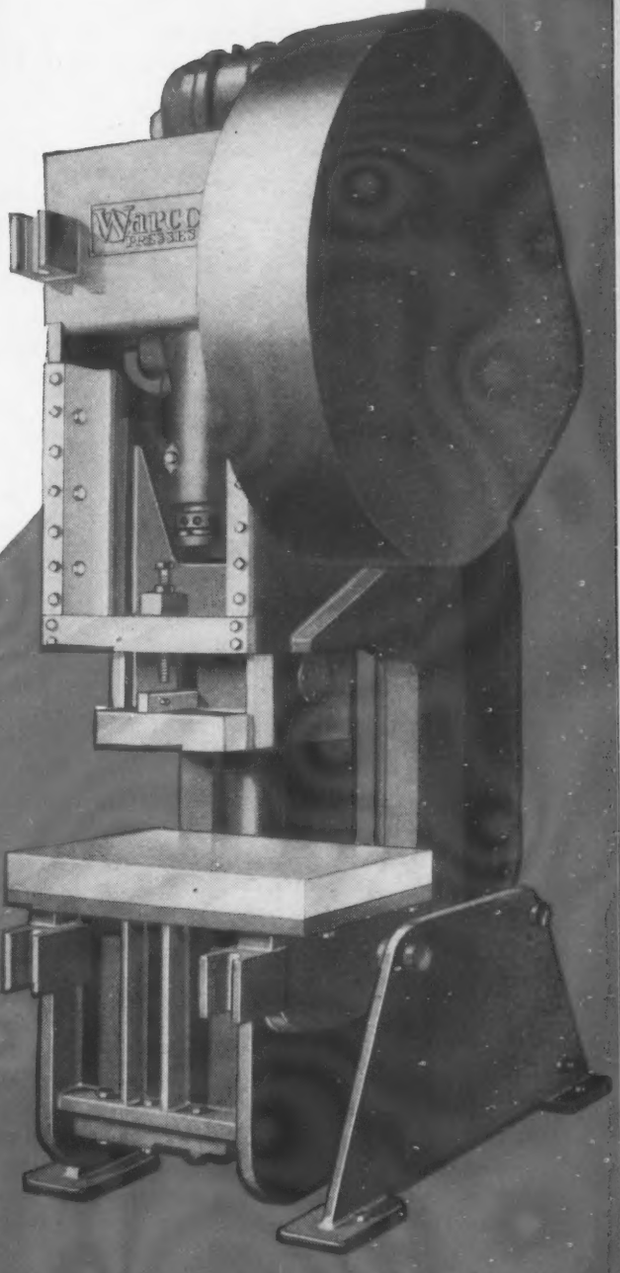


OPEN BACK INCLINABLE MODEL
Capacity range, 50 to 75 ton; stroke range, 4 to 14 inches. Single gear with electrical control.



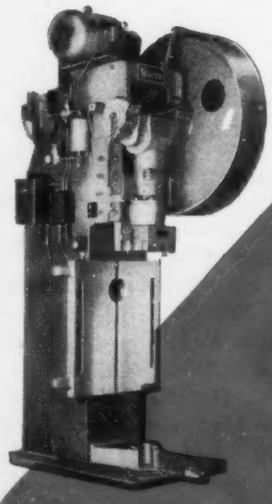
TWO-POINT ECCENTRIC-GEAR MODEL

Capacity range, 100 to 1200 tons; stroke range, 8 to 36 inches; between-housings range, 42 to 156 inches and longer.



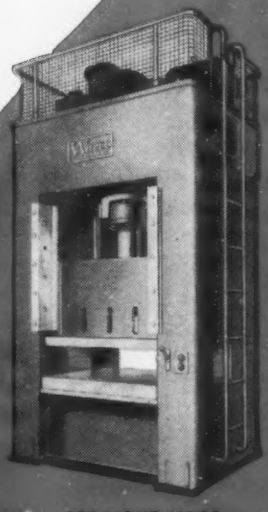
OPEN BACK INCLINABLE PRESS

Capacity, 200 tons.



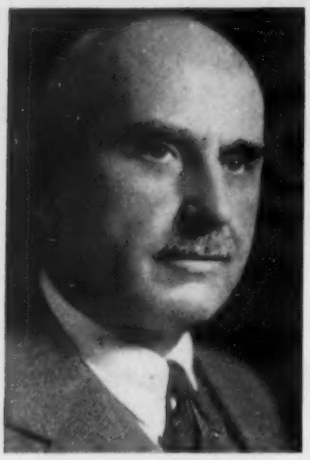
HORN PRESS

Capacity range, 50 to 200 tons.



STRAIGHT-SIDED HYDRAULIC PRESS

Capacity range, 100 to 1200 tons; stroke range, 10 to 30 inches; between-housings range 30 to 156 inches and longer.



DR. ANSON HAYES

Who has been elected a vice president, American Rolling Mill Co., Middletown, O., noted in STEEL, Dec. 9 issue, p. 85.

T. E. LEIGHTON

Named vice president and treasurer, Ohio Forge & Machine Corp., Cleveland, noted in STEEL, Dec. 16 issue, p. 82.

JOHN L. LANG

Appointed welding engineer, Lukenweld Inc., a division of Lukens Steel Co., Coatesville, Pa., noted in STEEL, Dec. 16 issue, p. 84.

year for his study of the social and economic implications of domestic measures for the control of atomic energy. Prior to joining OWMR, Mr. Newman served as a special assistant to the under secretary of war, as chief intelligence officer for the United States Embassy in London and as a member of the planning commission of the War Production Board. Mr. Newman will join the editorial board of *New Republic* magazine.

—o—

Albert F. Guiteras, of Foster D. Snell Inc., Brooklyn, N. Y., has been elected president of the New York professional chapter of Alpha Chi Sigma. **Foster D. Snell,** president of the company, has been elected an honorary member of Chemical, Metallurgical & Mining Society of South Africa. He is also president of American Institute of Chemists.

—o—

John W. Reichenbach has been appointed director of headquarters wage incentives, Westinghouse Electric Corp., Pittsburgh. He will be responsible for developing material for training personnel, assisting in promoting uniform administration of wage incentive policies, and developing procedures that tend toward higher productivity at lower costs. Mr. Reichenbach joined the company as a coil winder in 1916. Later, he was successively supervisor of time study, Large Oil Circuit Breaker Division; supervisor of time study, Switchgear Division; and director of wage incentives, East Pittsburgh Division.

—o—

Leverett S. Lyon, chief executive officer, Chicago Association of Commerce, and **Guenther Baumgart,** in charge of the association's War Problems Service, have been presented certificates of commendation from the President of the United States for services in connection with the Slective Service System. The War Problems Service, initiated before Pearl Harbor, formed a liaison between Selective Service administration and employers in an effort to preserve sufficient manpower for Chicago industries.

—o—

Harry R. Stringer has been appointed assistant to the chairman, Sea-Air Committee, National Federation of American Shipping. Until recently, he was vice president in charge of traffic and public relations for All American Aviation Inc., which he joined in 1939 when the company was organized. Prior to joining All American, Mr. Stringer was press relations officer, U. S. Maritime Commission.

—o—

Walter Evans, vice president in charge of all radio activities, Westinghouse Electric Corp., Pittsburgh, has been awarded the Army Certificate of Appreciation for his contribution to the Signal Corps in the development and production of radio and radar equipment during the war. Mr. Evans joined Westinghouse in 1921, as a radio operator in the then new KYW in Chicago. Successively he became chief engineer and general manager, and in 1932 was placed in complete charge of all Westinghouse radio stations. His duties were expanded in 1933 to include all radio activities of the company, manufacturing as well as broadcasting, and he was elected a vice president of the parent corporation in 1942.

—o—

Abner B. Wellborn has been appointed superintendent, Metallurgy Division, chemical department, Pittsfield, Mass., General Electric Co., Schenectady, N. Y. Mr. Wellburn joined the company's general office in 1935, and the following year went to the wage rate and planning section of the Schenectady, N. Y., works. He was appointed supervisor of wage rate, production and planning in the General Electric plant at Ft. Edward, N. Y., in 1942, and was named assistant to the superintendent of the Carbon Products Manufacturing Division in 1945. **Ernest E. George** has been appointed engineer of Metallurgy Division of the company's chemical department. He joined the GE test course in 1933. Mr. George was with the Schenectady works laboratory from 1935 until 1945 when he became a member of the Carbon Products Engineering Division.

—o—

William E. McCormick has been appointed chief of the industrial hygiene department, B. F. Goodrich Co., Akron. Duties of Mr. McCormick's department will be to study operating conditions to see if they are hazardous, and if so, to eliminate the hazards. Mr. McCormick had been in industrial hygiene work with the state health department of Georgia.

—o—

Frederick J. Lindauer has been appointed manager of the Washington office Fairbanks, Morse & Co., Chicago, succeeding the late **Robert E. Post.** Mr. Lindauer joined the company in 1923, in the Three Rivers, Mich., plant. He was moved to Baltimore in 1925, where he worked as sales and application engineer. From 1926 to 1931, he was inspection engineer for the company's factories in Beloit, Wis., Three Rivers, and Indianapolis. He then spent several years in the headquarters office in Chicago. In 1933 he became sales engineer for the New York branch. He joined the Washington organization in 1935, and recently had been assistant to Mr. Post.

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1947

ANNUAL FORUM ON

Technical Progress in Metalworking

On the following pages the Editors of Steel present comments by leading authorities on recent and prospective developments relating to the production of metals and their fabrication into finished products

Metallurgy	Page 212	Equipment	Page 275
Casting	Page 217	Heat Treating	Page 280
Forging and Forming	Page 222	Surface Treatment	Page 289
Joining and Welding	Page 226	Inspection and Testing	Page 296
Metal Production	Page 240	Lubrication	Page 300
Machining	Page 257	Materials Handling	Page 301

Metallurgy

Metallurgist becomes less an engineer, more a scientist. . . Boron "baptized" in war. . . . Scrap contamination still serious . . . .Research concentrates on new alloys and additions

Low Productivity and High Costs To Intensify Process Development

J. T. Jarman, general superintendent, Allis-Chalmers Mfg. Co., Milwaukee: "Huge problem before metallurgists and designers for 1947 will be that of applying wartime developments to peacetime products. There will be a general screening of processes for objective money-saving ideas in production. This does not necessarily mean cheaper products, but it does mean better design and metallurgical processing to fully utilize the knowledge gained during the war. Ordinarily this might cover a decade of development; but lower labor productivity and bigger material prices will force intensive development."

Boron and Molybdenum Alloys Put to New Industrial Uses

Norman F. Tisdale, metallurgical engineer, Molybdenum Corp. of America, Pittsburgh: "The lessons learned from making war material out of combinations of alloys other than those which were long in use are now being applied to postwar production.

"Molybdenum, being a domestic alloy, was constantly called upon to supply the extra properties which were needed when other scarce alloys were unavailable, Molybdenum, therefore, already useful in so many ways, now is firmly established in the iron and steel industry. Its dependability has made it a part of an increasing number of specifications. Diesel engines, gas turbines and jet engines are now classed as constant molybdenum users.

"Boron received its baptism of fire in war material and was not found wanting. Its use is constantly expanding in cast iron, malleable iron, steel castings and rolled products. It has made a real contribution to the malleable iron industry. Cast iron rolls are being helped by it. Many welding rods carry it either in the coating or in the rod itself. The use of boron in rolled steel is steadily increasing. One of the newer applications, wear resisting and hard surfacing, shows promise of greatly expanding the application of boron.

"Since the introduction of sintered carbides, no new use has been developed for tungsten. Tungsten still carries on its regular application in tool steel and dependable tungsten high speed steel is still the most specified."

Solves Problem of Segregation In High-Alloy Tool Steel

L. C. Grimshaw, chief metallurgist, Latrobe Electric Steel Co., Latrobe, Pa.: "Successful solution of the old problem of how to eliminate segregation in highly alloyed tool steels, such as the high-speed steels and the high carbon-high chromium steels, was consummated in 1946.

"Any highly alloyed tool steel that contains a large number of free carbides that are not all taken into solution during heating for hot forming, or for hardening, was subject to a heavy segregation of these carbides under the old method of working. Carbides of tungsten, molybdenum, vanadium, or chromium are very hard, and are of benefit in tool and die steels because they increase the abrasion resistance. But they are of benefit only if they are distributed evenly throughout a tool. As soon as segregation causes these hard carbides to be crowded close together in clusters, the steel contains hard, brittle areas that cause trouble during machining and in heat treating, and lead to service failures. In the past, all high-speed steels and high carbon-high chromium steels, were subject to this harmful segregation of carbides.

One process now in use has made possible regular day-to-day production of steel free from segregation. There is no change in chemical composition, other than one of uniformity, and therefore no change is required in heat treating procedures, but the effect of change in quality is of great benefit to many kinds of tools and dies.

"Production of highly alloyed tool steels essentially free from carbide segregation is a great step forward in steel manufacturing. Competent authorities believe this is the greatest improvement in high-speed steel since it was first introduced."

Metallurgist Becoming Less an Engineer and More a Scientist

Charles M. Parker, secretary, committee on manufacturing problems, American Iron and Steel Institute, New York: "The concepts of physics and physical chemistry continue to invade the realm of metallurgy. The metallurgist is becoming less an engineer and more a scientist.

"The trend in ferrous metallurgy continues toward the use of greater numbers of complex instruments to control manufacturing operations, and because of that control, the use of mathematical approaches to the solution of abstruse problems. There is greater use, too, of precision devices based on the priciples of advanced physics in the inspection and testing of steel.

"The facts revealed by those devices are widening the horizons of our knowledge of the internal structure of steel and the mechanisms by which changes of structure in the solid state are made possible. A commercial application of that kind of technology is a heat-treatable 18-8 stainless in which titanium forces the formation of ferrite in a normally austenitic steel and both titanium and aluminum force a precipitation-hardening action.

"Developments of a like nature have been made in the field of 'super-alloys' upon which atomic physics and jet propulsion depend for their success. The metallurgist has not been found wanting. Possibly, it is not generally known that among the atomic reaction products of fissioned iron are chromium and man-

ganese. That is a fact worthy of considerable thought.

"According to our Russian friends, they have far outstripped us in thinking and producing. Last year they announced a steel of 40,000,000 psi modulus. This year they announce rose colored steel and gold colored steel, both nonrusting. Stalin has been assured that no one else knows how to do it. He is content (!) with that assurance."

Copper Brazing and Interrupted Salt Quenching Aid Production

Arnold P. Seasholtz, consulting metallurgist, Seasholtz Metallurgical Service, Lancaster, Pa.: "Probably two of the more recent developments in metallurgy which have aided in simplifying production of complicated sections and helped to obtain good constructional properties are copper furnace brazing and interrupted quenching in salt baths. They are two distinctly different processes, but are often overlooked in simplifying manufacturing problems.

"Copper brazing is being used successfully in fabricating many complicated sections. It permits welding of difficult sections which would be practically impossible to form or machine. Copper is used to braze liquid in air tight containers, tool inserts, and the construction of parts on airplanes, automobiles and many other highly stressed parts. Some advantages of copper brazing over low-temperature alloy brazing compounds is its high strength of bond. Also parts can be heat-treated successfully since the copper brazing is not affected by the customary heat-treating temperatures.

"Copper brazing is generally done in either controlled atmosphere or salt bath furnaces, at a temperature slightly above 1980° F, the melting point of copper. Consistent results are obtained providing parts are clean and close tolerances are maintained on the joined sections. Copper has a strong capillary action causing it to flow uniformly and penetrate between the areas of the brazed sections resulting in a strong bond.

"Manufacturers who have developed copper brazing on war products are now using the method in production to simplify design as well as to reduce the cost of fabrication, still maintaining quality of product. It is believed that many who are not familiar with the copper brazing process are overlooking its possibilities.

"The interrupted quench in molten salt baths is becoming more popular by finding many new applications in the heat-treating field. Since passing the acid test, the method is no longer thought of as being used only for intricate tools, dies and complicated sections. It is now being adapted for many large production items to get optimum physical properties, a consistent product and with simplicity of procedure.

"One of the more recent uses of the interrupted quench is the quenching of parts case hardened in various cyanide salts. Salt quenching parts that were carburized in salts containing cyanide was originally avoided because of the explosive action of the cyanide and the nitre quenching salts. This hazard is being overcome by washing the carburizing salts off in a neutral bath composed of chloride salts before quenching. A constant check must be made of the neutral salt, and care taken that the cyanide content is kept well below 5 per cent. This procedure is being adapted in many large production carburizing jobs obtaining optimum physical properties, minimum distortion and maintaining closer manufacturing tolerances."

Scrap Contamination Still a Source of Grave Concern

W. H. White, metallurgist, Jackson Iron & Steel Co., Jackson, O.: "Demand for castings remains high and there is no immediate sign of a lessening of that demand. In the mad scramble of the war years, ferrous scrap was badly mixed and contaminated with every conceivable alloy. Many foundrymen give 'bad scrap' as their number one concern.

"As time goes on, much of this inferior material will be digested or removed from circulation by one means or another, only to recur at a later date to a lesser degree. There is no way of eliminating it altogether.

"Foundrymen require raw materials as clean as possible to minimize this contamination. The blast furnace is the only source of such material and phrases such as 'a blast furnace product' and 'smelted from virgin ores' have a new meaning to foundrymen. It is a safe prediction that their need will cause a high demand for pig iron for some time to come."

Metals Industry To Make Wider Use of Radiography

Royal G. Tobey, industrial x-ray staff, Eastman Kodak Co., Rochester, N. Y.: "Anticipating market conditions of the future, forward-looking firms in the metals industry are today establishing standards of price and quality on which their competitive position may depend, once supply has out-distanced demand. More and more such firms are installing radiographic controls or stepping up previous radiographic activities in an effort to improve quality and keep production costs down in the face of rising wages. The trend in industrial radiography throughout 1946 was toward extended usage along previously established lines rather than increased usage because of fundamentally new applications. These same conditions appear likely to prevail throughout 1947.

"As an example of extended use of present methods, publicity recently was given to the successful service record of an all welded locomotive boiler. Production economies and service advantages predict general acceptance of this addition to the growing list of high pressure equipment the soundness of which is proved by x-ray examination.

"X-ray control in the foundry is gradually increasing as more new patterns go through pilot casting stages with x-ray indicating the changes needed to get into sound production faster. Once a casting technic is established it usually requires only periodic x-ray spot checks to assure continued high quality. It stands to reason that foundries now turning out castings with a low rejection rate and good service record will be in the most favorable position when demand falls below capacity to supply.

"It has been said that in recent years foundry practice has progressed from an art to a science. Today's improved casting quality bears this out. As a scientific approach to the understanding and elimination of casting defects, work has been undertaken to provide x-ray motion picture studies of the formation of defects as they form in the solidifying metal within the mold.

"Every method of transportation is examining the economics of reducing dead weight and increasing pay loads. High strength alloy castings of x-ray con-

trolled quality permit lowered safety factors and increased pay loads.

"Microradiography has received more attention in the past year, and is finding increased applications as the method becomes more generally understood. Both in welding and foundry practice, microradiography proved useful in distinguishing individual elements present in a specimen and 'three dimensional' representation of segregation. By proper choice of radiation quality, the difference in radiographic appearance of elements may be exaggerated to facilitate interpretation. Photographic materials available permit 200 diameter magnification of the radiographs. The method is comparable to photomicrography but because the x-rays penetrate the specimen, a useful 'third dimension' is introduced.

"The demand for x-ray diffraction equipment is not all due to the increased budgets for pure research. An increasing number of installations are part of production controls providing information about the proper choice of materials and suitable treating methods to yield optimum properties for the intended end-use of a product.

"The increased use of radiography during the past year indicates that higher quality and reduced costs have again become controlling factors in our industrial structure. For the same reasons the use of industrial radiography is expected to increase during the current year."

Metals Research Concentrates On New Alloys and Metal Additions

R. H. Harrington, research metallurgist, General Electric Co., Schenectady, N. Y.: "For the year 1946, the conversion shortages, and strikes imposed noticeable handicaps even on research. However, the delayed disclosures of wartime developments helped to fill the gap.

"New alloys and metal additions include the following: New cast and wrought aluminum alloys containing copper and beryllium; iron-manganese alloys with manganese in the range of 1 to 7 per cent; tellurium in the iron foundry; turbo-bucket alloys; constitution of the indium-tin systems; new wrought zinc alloys containing copper and beryllium; binary copper alloys with 2 to 20 per cent manganese; alloys of copper-cobalt-manganese; boron in cast iron and alloy steels; and alloys of the copper-manganese-aluminum system.

"Further developments in processes include the following: hot deep-drawing in aluminum alloys; the mechanisms of carburizing and decarburizing; induction heat treatment; effects of subzero treatments.

"Fundamental knowledge has been increased by the following studies: Relationship of phase and structural occurrence of added elements relative to properties, with emphasis on steels; behavior and fracture of metals under combined stresses; and further development of such 'old-timers' as temper brittleness, stability of stainless austenite, hydrogen embrittlement, hardness and hardenability, and the transformation of austenite. There appeared to be a temporary decrease of interest in the further development of such subjects as effects of grain size, creep and rupture testing, corrosion tests, and the effects of furnace atmospheres. Perhaps a temporary practical stability in these fields has led to an intermission of satisfaction with the status quo".

Metallurgist More Selective in Employing Sub-Zero Treatment

Albert Neudoerffer, plant metallurgist, SKF Industries, Philadelphia: "One of the most significant trends in heat treating is the greater use and development of the electronic type instrument for controlling, indicating and recording temperatures. At SKF Industries, we were one of the earlier users of these for some of our heat treating furnaces, and found them quite easy to maintain and repair. Above all, we obtained much closer temperature control with all type loads due to the instrument's flexibility and sensitiveness, than we ever experienced with the conventional type instruments.

"In the final analysis, metallurgists or heat treaters may recommend temperatures and heat treating procedures, but it is often the controls that make the difference between a passable or a good job, particularly where close and dependable controls are necessary for a quality product.

"Another significant trend is the more selective use of the subzero treatment. A few years ago it caused considerable controversy as to its effectiveness on different steels etc., and it was often used as a 'cure all.' Now, for example, it is quite definitely known that in such applications as carburized low alloy steels, SAE 2000 series, it is very effective, and the steels are stabilized by the subzero cooling. Therefore, the future trend may find an even more discriminate use of this treatment, due to a greater knowledge of its effectiveness on different steels with various heat treatments.

"A third significant trend is the investigation of martensite formation, how it forms, when it forms, (M_s point), percentage formed at various temperatures etc. This increased investigation of the above rather controversial subject is particularly important due to the trend toward more martempering and isothermal heat treatment. As mentioned, there are still a lot of diverse opinions, but I believe the future trend will be a rather simplification of the important facts concerning martensite formation. This information will be a great benefit in securing the best results from various types of hot quenching."

New Concepts of Metallurgical Function To Bring Changes

F. E. Bowman, research laboratories, Climax Molybdenum Co. of Michigan, Detroit: "Research has in the very recent past contributed a great deal to the transition of metallurgy from an art to a science. The physical metallurgist is finding the emphasis in his field shifted to an ever-increasing extent. The time is rapidly approaching when he must, by training, be a metallurgical physicist. Not only are his primary research tools, the x-ray and electron diffraction cameras and the electron microscope, those formerly considered to be the sole property of the physicist, but his thinking must be in terms of the fundamental atom.

"The enumeration of the achievements of metallurgical research during recent years is impossible here. We can, however, review briefly the major trends of this research and note what may reasonably be expected to result.

"The most advantageous use of alloying elements in steel presupposes an understanding of the way in which they act to produce the desired effects. Such an understanding is only beginning to develop. Recent studies of the carbides in alloy steels indicate that the transformation of alloyed austenite is not the simple process of carbon diffusion to form ferrite and cementite. The process is much more complex. The continuation of such studies will eventually provide more than an empirical method of pre-

dicting hardenability and provide the steel metallurgist with a sound basis for designing the steel to provide the properties desired in the most economical way.

"The elevated sub-critical temperature applications of steels with the attendant problem of graphitization have received intensive study. No completely satisfactory solution to the graphitization problem has, as yet, been found. It appears, however, that a more thorough knowledge of the relative stabilities of the various alloy carbides and the factors affecting this stability is of the utmost importance.

"The design of the jet engine and gas turbine placed in the hands of the metallurgist one of the most difficult of problems. The speed and degree of success with which the problem has been solved is an achievement of which all members of the profession can be proud. Although the ultimate has by no means been reached, the high temperature strength and corrosion resistance thus far made available surpass anything considered possible in metals a few years ago.

"The research for such materials has opened an entirely new branch of metallurgy for investigation. Large scale high vacuum techniques developed primarily for non-metallurgical applications are providing metallurgists with a means of working with metals and alloys not adapted to the usual melting and casting methods. Chromium-base alloys, at present receiving intensive study, are only one example of the possibilities opened by these new techniques.

"A further outgrowth of the program to develop the high temperature alloys has been an increased interest in the refractory metals. Their use has, however, been restricted by the limitations of powder metallurgy. This restriction is rapidly being removed. The recent development of the vacuum arc furnace has provided a means of melting and casting the high melting point metals. Forgeable ingots of molybdenum have already been cast with mass much greater than anything which can be produced from sintered powder. We have here then a means of producing and investigating an entirely new field of alloys based upon such metals as tungsten and molybdenum. These properties available in such alloys are as yet only a matter of speculation.

"Although the metallurgist has, with remarkable success, been able to supply the needs of the designer, a tremendous amount of fundamental knowledge remains to be collected before the true scientific approach can be applied to metallurgical problems in modern design."

Potentialities of Carbides Not Limited to Tools and Dies

W. G. Robbins, president, Carboloy Co. Inc., Detroit: "Outstanding trend in the field of cemented carbides is their growing acceptance as almost 'general purpose' metals, offering numerous physical properties unobtainable in other metals. It was not so long ago that carbides were almost instinctively identified with just two types of products, cutting tools and draw dies. Carbides were actually considered only as 'tool metals' and 'die metals.'

"Today the horizon is much broader. Carbide metals are not being used solely because of their hardness. Many interesting uses are being developed for carbides based on other characteristics these metals possess. These include their ability to resist wear caused by abrasion and erosion; their extremely high elastic limit; their extreme comprehensive strength; their low coefficient of expanson, and even their toughness and ability to resist impact. The last three may seem surprising, since it has been generally assumed that extreme hardness inevitably is accompanied by extreme brittleness. Modern carbides have far higher abilities in these directions than either their hardness or the method of their manufacture would lead one to suppose.

"Taking advantage of these other characteristics has been made easy by the fact that carbide products are produced through powder metallurgy.

"This means that the products or parts can be pressed practically to exact shape desired—eliminating practically all subsequent forming, grinding or machining, in many instances. Furthermore, physical characteristics can be duplicated exactly from piece to piece since these characteristics can be controlled accurately.

"It should not be assumed however that carbide cutting tools or dies are being relegated to a position of minor importance. On the contrary, the manufacturer is rare today who does not first ask 'can we use carbide tools?'—on practically every new job and machine that comes along. Economics of production costs dictate this procedure under present conditions.

"In the die field, too, there is a noteworthy expansion in the extent of use of carbides, primarily to obtain longer die life with resultant lower overall production cost, but also to improve finish obtained. Recognition of the ability to impart 'toughness' with hardness to carbides, for instance, has led to a rapidly growing appreciation of this metal for punching, blanking and similar types of dies—fields formerly considered by many as beyond the sphere of metallic carbides."

Titanium-Hardened Alloys Ideal For High-Temperature Service

Howard Scott, manager, metallurgical and ceramics department, research laboratories, Westinghouse Electric Corp., East Pittsburgh, Pa.: "Intensive studies of the effects of composition and structure on the mechanical properties of alloys at elevated temperatures are being made in many laboratories. One such investigation was sufficiently advanced for publication of much of the results the past year. It was concerned chiefly with precipitation hardened austenitic alloys and particularly those hardened with titanium.

"They provide a remarkable combination of forgeability with strength in the temperature range 1200 to 1500° F. One such alloy when subjected to exacting control of fabrication and heat treatment yielded an endurance strength at 1200° F. of 83,000 psi based on 100 million cycles of reversed bending. Accompanying creep-rupture strength at 1200 and 1350° F is exceptionally good, though that at 1500° F is somewhat less than can be obtained with a treatment which reduces endurance strength.

"Another titanium-hardened alloy containing over 50 per cent iron is well adapted to service in forged rotor disks at temperatures up to 1400° F. This alloy is designed to have high ductility even at the temperature of minimum ductility and combines this property with excellent elastic and creep strength up to 1200° F at least. Fast cooling of the alloy after solution treatment is unecessary to obtain high strength; air cooling of even large sections is adequate.

"The attainment of useful properties at 1500° F has occupied many years of diligent work in industrial laboratories. Nevertheless the design engineer is demanding higher service temperature ceilings with no relaxation of load and life requirements. It is too early to say

that we have reached the limit of conventional metals and techniques, but it does appear probable that some new approach to the problem as yet unannounced will be necessary to achieve a notable increase in temperature rating".

Effect of Vacuum on Physical Properties Object of Research

Eugene D. Milener, co-ordinator of general research, American Gas Association, New York: "The committee on industrial and commercial gas research of the American Gas Association is sponsoring a project, Research in Controlled Vacuum Heat Treating. The project was assigned by the committee about one year ago to the laboratories of Surface Combustion Corp., Toledo, O., where work has been in progress ever since.

"The subject of vacuum offers an almost endless variety of experiments to be attempted. The effect of vacuum on physical properties is unknown. It is felt that many processes which are impossible or difficult by ordinary methods might be successfully carried out in vacuum. In many cases knowledge about existing processes might be obtained by vacuum equipment which is impossible to resolve by other means. The initial approach to the project was a study of the effect of vacuum on the physical properties of more common steels.

"Purpose of this research is to determine the effect of relatively small amounts of absorbed gases upon the common operations of annealing, malleablizing, quenching, drawing, spheroidizing and carburizing. The general manner in which this end is being accomplished is by comparing certain steels heat-treated in conventional atmospheres with steels heat-treated with all gases eliminated from the interior of the metal as well as from contact with the surfaces. Special equipment has been designed and constructed. Initial reports, which although they are of an exploratory nature are positive in all cases; they are being studied by the research committee and it is not known at this time when published reports will be available.

"In co-operation with Selas Corp. of America, the American Gas Association research committee is making studies of the speed of heat absorption by metals. This work is contributing toward the rapid advancement of high speed direct heat treating and forging."

Salt Baths in Series Prevent Distortion of Intricate Parts

C. R. Foreman, metallurgist Park Chemical Co., Detroit: "The first full year of postwar production has seen the salt bath method of heat treating steel expand its place in industry. Not only have salt baths found a place in the production lines of industries which are mass producing goods for civilian consumption but their flexibility has also found favor with smaller shops and commercial steel treaters. Moreover, new and improved methods of operating salt baths seem to assure their continued growth in popularity.

"Among the recent developments in neutral salt baths is a method for maintaining neutrality which does not involve sludging, the use of rectifiers, or the necessity for large additions of fresh salt. A relatively new process, for which a patent is pending, is based on introducing small amounts of an inexpensive gas into molten chloride-base neutral salts for short periods of time.

"Salt baths in series, with or without conveyorized equipment, are now employed to carburize and isothermally quench intricate machine parts in order to avoid distortion and simplify heat treatment. In addition, a process has been developed to provide an inexpensive, non-corrosive, easily washed liquid carburizing medium. A light flow of a low-priced and easily obtained gas through a molten cyanide-base salt mixture operated under a carbon cover is the basis of the process for which a patent has been applied."

Metal Deformation and Fracture To Receive More Attention

C. O. Dohrenwend, research consultant, Midwest Research Institute, Kansas City, Mo.: "Deformation and fracture of metals is a subject that is now receiving much attention. Basic understanding of the complicated mechanisms involved in these two processes is very meager. Metallurgists and engineers are, however, renewing their efforts to gain more knowledge about the physical laws that control the mechanism of mechanical deformation and fracture. It is to be expected that the newer techniques developed with micro-hardness devices, x-ray diffraction, and the electron microscope, along with other techniques still to be devised, will answer many of the problems arising every day in the metalworking shop, both in metal cutting and drawing operations.

"At the present time research and progress on the problem appears to be mainly academic in nature, especially to the people concerned with production. However, academic studies always precede the adoption to practice of advances made in the solution of any problem which has resisted rationalization for as long a time as the deformation and fracture problem. This approach is simply an indication that the logic used to date and the experimental data accumulated have not been wide enough in scope or profound enough in theory to make clear the physical laws controlling the mechanism involved. The rational answers which will allow major improvements in production methods can only come when these physical laws governing the deformation and fracture phenomena have been further determined and digested both by the scientist and engineer.

"The past year has seen many research reports and reviews on this subject. These reports have been concerned with the effect of temperature, of dynamic loading, creep, fatigue, fracture-crack speed, and a host of other topics. The important trend, however, is not the type of subject investigated, but rather the fact that the reports show the tendency to shed old concepts and methods of analysis in an attempt to form a newer and better understanding in the light of the newer techniques."

Tension Tests on Tubes Reported

Although they rupture more easily, manifest local irregularities more quickly and behave more erratically, thin tubular rods of 1045 steel show less flow stresses than solid cylindrical rods under the same tension. This conclusion is reported in the U. S. Army report now on sale by Office of Technical Services, Department of Commerce, written by Prof. P. W. Bridgman of Harvard University and published by Watertown, Mass. Arsenal.

An analysis of stress pattern during necking as well as observations on strain-hardening and fracture characteristics are included along with results of six different tests conducted. Orders for the report, Tension Tests on Tubes under Hydrostatic Pressure, PB-30256, should be addressed to above department, Washington.

Casting

Better machines and alloys improve quality of die castings . . . Gains in fundamental research benefit steel casting . . . Competition stresses importance of mechanization

Gray Iron Foundry Techniques Achieve Dimensional Precision

Donald J. Reese, development and research division, International Nickel Company, Inc., New York: "The composite performance of the gray iron castings industry during 1946 was poorer than the subnormal war years. Raw material, governmental controls and labor problems were the major retarding influences. The composite industry did not improve its metallurgical or inspection standards.

"Equipment builders, engineering and consulting firms to the foundry industry have been swamped with orders intended to modernize the industry's processing and production methods. The 'sealed beam' automobile lamp was adapted to the tough problems of adequate lighting in the foundry, this year, and appears to put sufficient candlepower at the working level.

"Improved foundry techniques to achieve a high order of dimensional precision and the desire to do a better job at the foundry level in co-ordinating the foundry manufacturing process, the engineering material and end use performance of component parts were noticeable trends in specific foundries. In the wide variety of types of cast iron produced by this industry, the martensitic white irons made the most progress."

Better Machines and Alloys Improve Quality of Die Castings

R. W. Dively, metallurgist, The Hoover Co., North Canton, O.: "The die casting industry can look back over the year 1946 and see an increased demand for aluminum and zinc base die castings. The supply has not been great enough to meet the demand; therefore, the manufacturer has been able to obtain the most desirable business and keep the equipment operating at maximum capacity. New equipment, mostly of the cold chamber type for aluminum die castings, is being built and installed to meet demand.

"The quality of die castings has been improved the past few years due to the improved type of machines, better metallurgical control, non-destructive testing facilities and better alloys and control of their composition. The elimination of the gooseneck type of equipment and the installation of the cold chamber machines have done much for the improvement of the quality from an internal and external view point. Die castings made by the cold chamber process have less porosity, which has been a great asset to the user.

"The discovery of new chemicals for purifying, and the method and means in which the alloys are handled have improved the castings from a structural value. This has been accomplished by the elimination of oxides and other nonmetallic impurities that are detrimental to the alloy. Along with this, pyrometric controlled furnaces have helped to remove oxides by keeping alloy at proper temperature. These impurities are injurious to the die casting from a structural standpoint to the user, and decrease the castibility of the alloy for the manufacturer.

"Some of the die casting companies are conducting research programs and others are contemplating experimental projects. Also, the American Society of Testing Materials has organized a committee for die casting research. A benefit will be derived from this research work for the consumer."

Dry Sand Alloy Steel Castings Recommended for Crankshafts

H. L. Day, research metallurgical engineer, Auto Specialties Mfg. Co., St. Joseph, Mich.: "The stimulus given to cast ferrous metals by the recent war requirements, produced an unforseen degree of improvement in the manufacturing technique of the cast metal industry. The demands of our current peace time economy have not in the least relinquished the quality pressure, but on the contrary, have served only to accentuate it.

"The automotive engine in our current passenger car and truck models, in general, appears conventional and with almost imperceptible changes over prewar engines of similar duty. But this condition can be expected to remain static only as long as the present day production effort in the manufacture of automotive vehicles is absorbing such large quantities of our materials and so much of our manpower.

"However, it can be predicted with certain assurance, that when the automotive industry finally catches its production breath, our engines will be changed in design and principle and finally brought in tune with our advancing fuel, lubricant and highway technology. One of the major factors that narrows the scope of development of new designs in automotive power plants, has been the limitations imposed on crankshaft design through the use of conventional wrought metals.

"Irrespective of design or material requirements, crankshafts now can be expertly manufactured, on commercial and economical bases, most logically through the use of electric alloy steel castings, made in accurately prepared and assembled dry sand molds.

"The variations in design that can be obtained in a split die or mold have reached a level beyond which it is unlikely that important progress can be made. Through dry sand composite molding, it is possible to pick up where the previous processes have left off, and provide the automotive engineer with the designs that will be important factors in tomorrow's cars and trucks. With actual case histories showing reductions in weight up to 30 per cent over split die wrought cranks, it is perhaps an unexpected feature to find that a great deal of tedious machining has been eliminated, due mostly to close clearances, but also to the elimination of the draught that appears in the conventional split die product.

"It is obvious that the plastic characteristics of metals have no effect on the

cast alloy process, and thus, there is offered an almost unlimited array of alloys that can be successfully formed into crankshafts through casting. One type of composition, with three selectable variations, produces alloys that provide not only strengths and stiffnesses indistinguishable from the few traditional steels now used, but in addition, provides definite inherent wear resisting properties and damping qualities not obtainable in our wrought metals.

"An effective heat treatment has been designed for quantity production of the numerous designs of crankshafts. Employing the most modern temperature control, with a completely continuous cycle, this treatment is three-way in action, taking full advantage of the contained alloy combination, to produce high physical through effective homogenization, in which the crankshaft is straightened through natural relaxation. Then, through the use of a controlled quench of slow velocity, there results a crankshaft with residual strains of such a low order, that straightening is never required after machining.

"When it becomes necessary to produce quantities of special parts for radically different automotive power plants, the cast alloy crankshaft experience will lend itself readily to the manufacture of high speed rotors, heat resistant chambers, and high strength members, predicted by far-sighted automotive engineers."

Gains in Fundamental Research Benefit Steel Casting Industry

Charles W. Briggs, technical and research director, Steel Founders' Society of America, Cleveland: "The overall position of the steel casting industry on technical control and development is excellent. The very favorable position created by the industry during the war years through a step by step building of quality controls has not diminished during this first year of peace production. In fact, the release of pressure resulting from quantity demands has resulted in more attention to casting quality and technical developments.

"The universal use of necked-down feed risers was of considerable assistance in speeding up casting production by reducing the number of operations in the cleaning department and decreasing costs. Use of necked-down risers has been extended to side-feeding risers, blind risers and to risers that are attached to castings of various shaped contours. Also extensive work during the year indicated that refractory cores for necked-down risers give good service and standard shapes are advantageous in many applications. Studies indicate and experience proved that the necked-down risers can be used on casting sections which require feed risers upward of 36 in. in diameter.

"Experiments on the pressure feeding of steel castings with pressures greater than atmospheric were reported on during the year, and this method of feeding is being investigated by a number of steel foundries.

"Precision casting of steel is continuing its forward movement. Most steels cast by the investment molding process have been of the corrosion and heat resistant type, however, in the last year experience has been gained in the casting of the low alloy steels.

"Production problems, involving operational costs, metal feed demands, sands, evaluation of supplies, are being investigated. Cast steel properties have been continued during the year to increase the knowledge of the purchaser as well as the foundryman as to the wide field of application of steel castings.

"Considerable information has been developed during the year on the hardenability of cast steels and the method of producing steel castings to hardenability specifications. The Society of Automotive Engineers adopted, during the year, a new specification on steel castings for automotive use. One portion of this specification requires the supplying of alloy steel castings to hardenability values. A symposium on the production of steel castings to hardenability specifications was presented by five authorities of the steel casting industry before a technical and operating conference of the Steel Founders' Society this last summer.

"A further understanding of the problem of graphitization and what to do aboiut it has been given to the industry by a number of investigators. A few purchasers of steel castings have prepared specifications which have required the regulation of aluminum content during the deoxidation of the molten steel. But from developments on controlling the use of alloys, aluminum deoxidation requirements is not the entire story.

"Research is being conducted along purely fundamental lines such as gases in steel, and homogenization heat treatments to assist in quality control of the product. A very excellent report was prepared by Carnegie Institute of Technology for the Steel Founders' Society on the austenite grain size of cast steels. It indicated that five methods may conveniently be used simultaneously in measurement of the austenite grain size of carbon and low alloy cast steels. These methods are: Martensitic etch, gradient quench, normalizing, fracture, and oxidation. The martensitic etch method gives correct results and is the most consistent in revealing austenite grain size of the methods studied. Its use as a routine foundry laboratory test is recommended."

Zinc Die Casting Greatly Accelerated

R. Davison, manager, Market Development division, New Jersey Zinc Co., New York: "Die castings appear to be in a fortunate competitive position in the economic outlook, with the existing heavy demand for consumer goods where most die castings are used. For one thing, there are better and more extensive facilities for producing die castings than ever existed before, the total number of machines in use having been greatly increased. Many obsolete machines have been replaced by faster and better machines.

"Makers of die casting machines are booked to capacity for many months ahead, and more companies are now making die castings for their own use, as many commercial die casters have been unable to keep pace with demands for increased output.

"The purchase of die castings, or the installation of die casting equipment, has further been accelerated because the cost of sand castings has risen more in proportion than that of die castings, and this has turned potential purchasers of small sand castings to die castings.

"Inasmuch as die castings save a large proportion of machine work, there is a natural trend toward the substitution of die castings for other products whose extensive machining work has suffered from high machining costs. With the present relatively high prices of all materials, there is a natural trend toward processes involving as small scrap loss as possible. Finishing costs generally are lower for die castings than for sand castings and some other metal products, due in part to the exceptionally smooth as-

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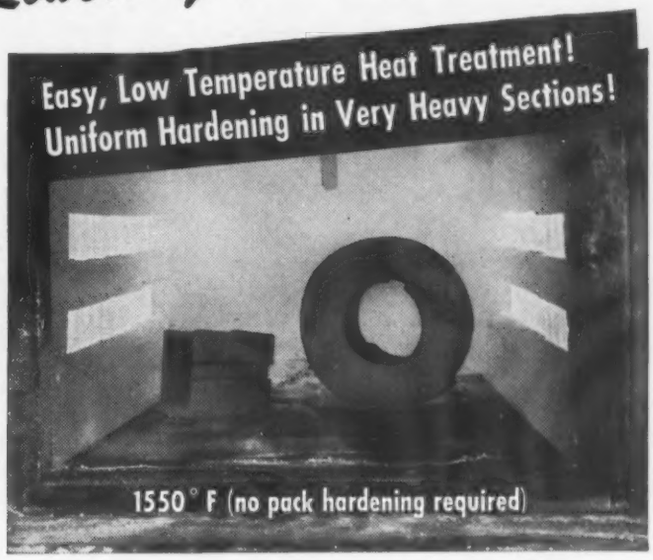

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cast surfaces, and is an added advantage at this time of high costs and demand for good appearance.

"The economy and utility of die castings have become known to many companies through their wartime activities, and will be incorporated for the first time in their own postwar products. There is little to indicate pronounced alteration of the prewar balance between the more important competing die casting alloys."

Precision Casting "Comes of Age" —Seen as New Production Tool

W. O. Sweeny, Haynes Stellite Co., Kokomo, Ind.: "Since V-J Day, the precision casting process had opportunities to prove what it can do as a tool for modern industry. Like many new processes, it was originally looked upon as a cure-all; however, it is now generally recognized that precision casting is best suited to production of shapes that cannot be obtained economically by conventional methods of manufacture, or to alloys that are not readily machined, forged or formed. Precision casting cannot compete on a price basis or on dimensional accuracy with parts made by screw machines, coining, stamping, die casting or other established means of quick, cheap reproductions.

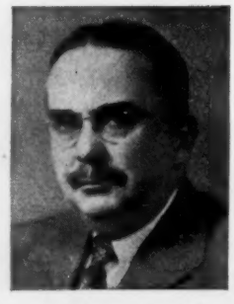
"Many claims were made of the close tolerances that can be obtained by precision casting. True, tolerances of 0.002-in. or 0.003-in. can be produced on small parts under closely controlled laboratory conditions. However, it now appears that commerical tolerances of plus or minus 0.005-in. per in., with a minimum of plus or minus 0.003-in. can be maintained on the majority of parts supplied in production quantities. When closer tolerances are required, a finishing operation is generally necessary. Perhaps the fullest advantage of precision casting is gained by casting profiles to size, and finishing bearing surfaces or other close tolerance surfaces by grinding or machining.

"Much of the early impetus for precision casting was in the production of turbo-supercharger buckets, and later, gas turbine parts. The gas turbine field still continues to be a natural application for this method, since aircoil contours of materials hard to machine, forge, or form can be economically obtained. In addition, the physical properties of precision-cast high-temperature alloys are particularly suited to withstand temperatures above 1350° F. At present, most gas turbine manufacturers are using precision-cast stainless steel for the stationary axial flow compressor blades; 25-20 stainless steel or Stellite alloy No. 21 for nozzle vanes; and one of the cobalt-base Stellite alloys for the turbine blading.

"In the past year precision casting has already asserted itself as a manufacturing process, and many parts of intricate shape were precision-cast and successfully used. An idea of the wide possible application for precision casting is conveyed by the fact that numerous items are being regularly cast by this method—horseshoe caulks, zipper slides, peach pitters, golf club heads, canning machine parts, tool post wedges, shot gun and rifle parts, chicken wire twister gears, surgical and dental instruments, mining machine parts, mechanical milking mechanism bodies, calculating machine parts, diesel engine precombustion cups, textile machine parts, aircraft engine exhaust couplings, propellor hubs and aircraft 'hardware'.

"The process has opened up a brand new era for the design engineer. He now can use alloys that were not previously available because they could not be readily made into the desired shape. Furthermore, he now is not limited to designs that can be made only by conventional methods. Precision casting makes possible the fabrication of intricate contours and shapes that formerly were not practical with any alloy on a production basis. In the steam turbine field, for example, the design engineer was limited to shapes and alloys that could be readily milled or extruded. Now he can design for maximum efficiency by putting in all desired angles, using a super alloy for higher temperatures and pressures."

Competition Will Force Foundry Modernization



John Howe Hall, Swarthmore, Pa.: "A major part of the efforts of management in the steel foundry industry has been directed toward modernization of plant and installation of mechanical handling devices, with a view to keeping down costs in the face of rising labor rates. This is true not only of the shops making large quantities of castings from a relatively few patterns, where mechanization has already been carried very far, but of the jobbing shops as well.

"Of course complete mechanization of such shops is not considered desirable, or even possible in some instances, but nevertheless the old hand methods have been largely eliminated in a considerable number of the more progressive companies, and others will no doubt have to fall in line if they are to meet competition.

"The use of the Williams blind riser and its numerous modifications has made continued progress, especially in foundries making medium size and small castings. Some difficulties have cropped up in applying this method to some of the special steels, but are being cleared up. The economy of metal made possible by this method, especially in grinding and chipping costs, commends it to all progressive foundrymen.

"The same thing is true of the Washburn or 'Necked-down' head, a revival of a method originally introduced some 40 years ago, and temporarily discontinued when the oxygen-gas cutting torch was developed, making it possible to cut off even very heavy heads economically. Increased labor costs have revived interest in this method, which leads to considerable reductions in grinding machining time.

"Centrifugal casting methods, which were much to the fore during the war years, have gone a little into retirement as further work with them has served to bring out their disadvantages and limitations. This is more true of what are called centrifuging and semi-centrifugal casting, than of true centrifugal casting about a vertical or horizontal axis, where castings of the general shape of a tube are produced without any central core in the mold.

"The extending use of steel castings at sub-zero temperatures has stimulated investigation into the best compositions and heat treatments to produce steels with high strength and shock resistance in this type of service. Simultaneously, the problem of graphitization and consequent embrittlement of castings used at high temperatures, has continued to command the attention of metallurgists.

"Thus the addition of small amounts of chromium to the existing low-alloy compositions is at present the favored solution, but the last word has by no means been said on this head.

"A start is being made in introducing requirements for hardenability in specifications for steel castings for special applications. This is but a part of the general tendency to eliminate from specifications, requirements for composition, etc., and substitute clauses that call for the properties desired in the metal."

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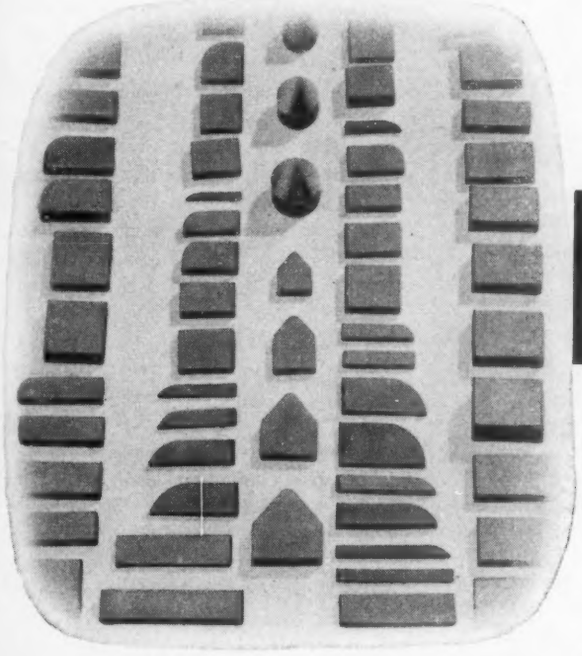

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Forging and Forming

Improved forging techniques reduce waste of materials . . . New alloys to modify practice . . . Large-scale use of hard carbides for dies foreseen

Large-Scale Use of Hard-Metal Carbides for Dies Forecast

K. R. Beardslee, vice president, Carboloy Co. Inc., Detroit: "Large-scale adoption of hard-metal carbides for metal punching, piercing, upsetting, and forming dies, etc., is one of the major trends at the present time. Long dormant, this field of application for carbides has suddenly grown to major importance.

"This development is traceable to a number of factors, chief of which is a broader understanding that physical characteristics can be built into hard-metal carbide almost at will. Although simple dies for this type of work were made and have been in use for 15 years, the opinion prevailed rather generally in industry that carbides were too 'brittle' to be desirable for such operations on a large scale.

"This belief was not an unnatural one, since brittleness is almost always a corollary of 'hardness.' What was not understood was that carbides, being synthetic powder metals, could be given almost any type of physical characteristic desired, within limits. Thus, through proper proportioning and selecting of ingredients, carbides can be given high degrees of toughness and shock resistance where required.

"Until this became more widely known, neither the die manufacturers nor die users were particularly interested in using carbide dies for work in which toughness and transverse rupture strength were important die metal requirements.

"Following the war, several progressive die manufacturing organizations interested themselves in the possibilities of carbides. The results obtained were almost surprisingly good. Word quickly spread as to lengthened die life, improved finish, etc.

"Die users themselves have now begun to ask for carbide dies for all kinds of applications and numerous interesting developments are already under way in this direction. One user for instance, has decided to equip progressive type of punching, forming, and stamping presses with carbide dies throughout. Another company has practically standardized, wherever possible, on the use of carbides for small parts. Carbide dies already are standard for piercing and punching out of motor laminations, where they have not only multiplied die life many times but eliminated the tough-to-control burrs on the edges of the laminations.

"It would not be surprising to find that hard-metal carbides eventually will duplicate in the punching, upsetting, and metal forming fields the successes already achieved in wire and tube drawing."

New Alloys To Modify Normal Forging Practices

W. Naujoks, chief engineer, Steel Improvement & Forge Co., Cleveland: "With the first year of the post-war period behind us, it is certain that considerable progress will be seen in metal technology and in metal working technique.

"Interesting developments are being made in the forging of high temperature alloys, particularly for use in gas turbine and jet engine service. These new alloys require new techniques and considerable modifications from normal forging practice, in order to forge them successfully to the close tolerances required. Many new problems have been encountered, and the coming year should offer some desirable results. It is reasonable to believe that these high alloy forgings will prove useful for many exacting applications in many types of industries.

"Considerable thought is being given to the use of standard alloy structural steel forgings in place of carbon structural steel forgings. A two-fold purpose is in view: Stronger sections that are lighter in weight, and greater overall economy. There appears to be every indication of the widening use of alloy steel forgings."

Improved Forging Techniques Reduce Waste of Materials

R. M. Seabury, secretary-treasurer, Drop Forging Association, Cleveland: "As evidence of reductions in the waste of materials accomplished by improved forging techniques, which were developed to meet wartime production requirements, the following examples are cited:

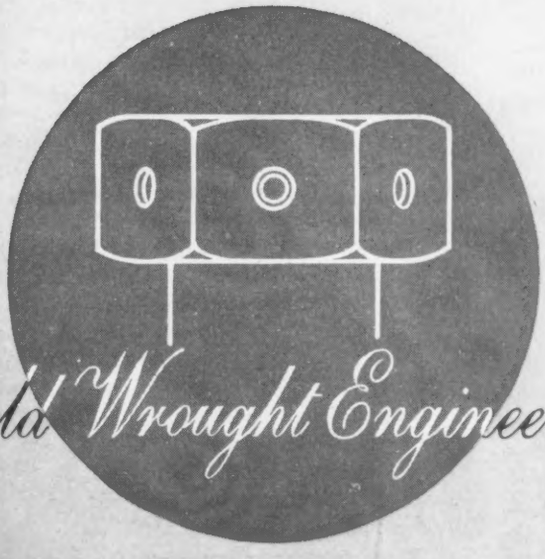
"A sprocket forging was produced that weighed approximately 18 lb less than the bar stock from which the part was originally machined; 8400 lb of steel were saved on 10,000 eye rings, a very simple part which was formerly machined from bar stock; a brake camshaft formerly machined from bar stock required a piece of metal 4 in. long by 1 9/16-in. in diameter, weighing approximately 2.17 lb. This part was upset forged with closed impression dies from a piece of metal that weighed approximately 0.93 lb, and when finally machined, the forged part weighed approximately 0.81 lb, which shows how close tolerance was held.

"Spindle drive gears for a machine tool, formerly machined from bar stock, required four chucking operations and broaching a keyway, whereas these gears, when forged in closed impression dies, effected a saving of nearly 80 per cent in man-machine hours. The changeover from shaping an actuating lever embodied in a disk clutch from cold-rolled bar stock to forging to shape in closed impression dies made it possible to effect a 38 per cent saving in the weight of the part—which gives some indication of the metal that must have been saved—and a 220 per cent increase in the rate of machining this part.

"Numerous instances of reductions in wastage of metal and machining time are being realized as a result of the advancements in forging close tolerances in closed impression dies which have been made during the last four years.

"Forging metal in closed impression dies forms parts to close tolerances, practically eliminating rough machining

the things that hold things together
must be stronger than the things they
hold together . . . that is why Chandler
cold wrought engineered products are
so carefully designed & manufactured



Chandler Cold Wrought Engineered Products

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and confining the finishing operations to finish machining or other close tolerance finishing operations. This has the effect of increasing the output per machine tool unit per hour and per day. The forging of metal in closed impression dies includes drop forging, machine or upset forging, and press forging.

"But forging to close tolerances is not the only way in which economies in the use of metal are effected. Uniformity of metal quality obtained by forging in closed impression dies reduces scrap or rejects to the point where waste is practically nil. The control and direction and concentration of fiber-like flow lines are given thorough consideration in designing the die impressions so that the maximum qualities will be developed. But at the same time consideration must be given to steps and stages in the actual production of the forging, which affect its cost, in order that the cost and quality relationship of a forged part may be maintained in proper balance.

"A set of closed impression dies for forming a specific forging cannot fulfill their function of cost-reducing tools unless they are designed and made to fulfill all requirements for developing maximum metal quality, and for obtaining lowest piece price for each part at the point of assembly. These economies in the use of metals are not restricted to any particular class of forgings as to size, shape or weight. Even such common forgings as connecting rods for internal combustion engines are being forged with greater skill to closer dimensional and weight tolerances. This is true for hundreds of other parts used in automobiles, trucks and tractors, agricultural equipment, railroad equipment and aircraft, as well as a wide variety of parts for industrial and contractors' equipment."

Press Manufacturer To Assist Stampers with Engineering

Albert Clements, chief engineer, Warren City Manufacturing Co., Warren, O.; "During the past year many advancements have been made in the metal stamping field. Parts that were formerly cast, or fabricated in some similar way, have been redesigned in order to take advantage of the savings effected when produced in sheet metal. Other advantages are: Parts are lighter, thus saving scarce materials; more uniform; and can be produced with a minimum of skilled labor. These factors all add up to an unprecedented demand for stampings and in most cases parts will continue to be produced in the same manner, as it is both economical and practical.

"Press manufacturers have worked closely with press users in supplying both standard and special presses. Working in close co-operation, the press manufacturers, die makers and press users have done a remarkable job of making the most of the materials available. The degree of co-operation is best attested to by the phenomenal production figures which have resulted.

"We are looking forward to a year in which the demand for stampings will reach new heights. As a press manufacturer, Warren City Manufacturing Co. is planning a long-range program to assist the stamping manufacturer in engineering for his production as well as to supply him with equipment to meet all production requirements."

Shortages Further Substitution Of Metal Stamping for Castings

Roger E. Risley, manager of engineering, Dresser Mfg. Division, Dresser Industries Inc., Bradford, Pa.: "Not a new, but a significant development in fabrication of metal parts is the further and accelerated substitution of metal stamping and fabrication by welding for castings. The existing shortage of castings, and the great increase in the price as a result of this shortage, leaves the way open for the fabrication of many parts at competitive prices from rolled steel.

"During the past year, there has been serious study of the subject of getting special shapes and bars made, so designed that they may be readily adapted to welding fabrication.

"There is more tolerance on the part of designers in radically changing the appearance and traditional design of a machine or machine part so that it may be redesigned functionally, and for new methods of fabrication.

"Considering all the physical properties, steel bars and plates are the cheapest structural material ever produced. Processes of fabrication of steel are generally fast, giving a large number of parts per man hour. The assembly of several simple components into an intricate part by flash, projection, or other mechanized welding process is inexpensive and simple when properly tooled.

"It is reasonable to expect this trend to continue, since there is no immediate prospect of relief from the current labor shortage which has been existant in foundries."

Forging Industry Enjoys Good Competitive Position

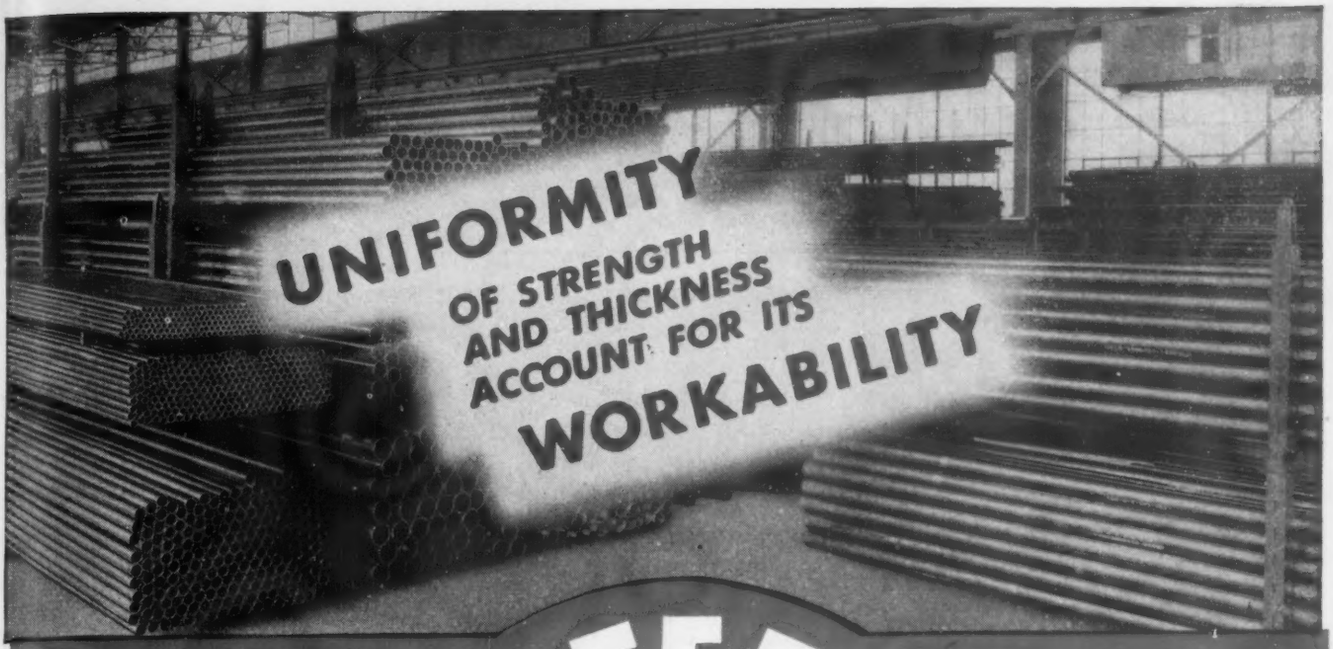
R. H. Jones, National Machinery Co., Tiffin, O.: "During recent years the high-speed forging Maxipres has been revolutionary in the forging field. The urgency for the mass production of steel and noferrous forgings for planes, tanks, guns, ammunition, trucks, ships during the war gave added impetus to this trend.

"Major improvements in the press design and construction enable present models to produce more accurate, minimum finish forgings at a higher rate of output. In addition, die life has been improved to such an extent to make many types of jobs attractive to press forging from the viewpoint of die life alone.

"An outstanding example of modern everyday forging is an automotive differential pinion made by a large producer of axle and transmission assemblies. This pinion is produced—complete with the teeth—on a Maxipres, and the technique involves hot forging and hot and cold coining. The job is of such finish and accuracy that the only machining is on the back face and in the hole —there being no machining whatever on the teeth. Not only is the pinion held to extremely close limits it possesses vastly improved wearing qualities and it is far cheaper than a pinion made by conventional methods.

"Another recent development, which is bound to have far-reaching effect in the forging field of small work, is the use of the automatic cold header as an adjunct to the press. Preparatory blanks are formed cold from wire on the header. These blanks are then heated and hot-forged to final shape. Mass-production jobs like automotive tie-rod ends and wheel nuts are now being produced in this manner with big savings in material and great increase in output resulting from use of the method.

"These developments — together with improved technique and engineering and mechanical advancements in horizontal upset forging machines—places the forging industry in a most favorable position to meet the challenge of the keenest kind of competition."



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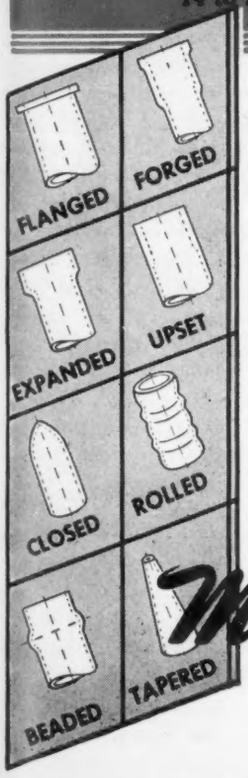

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Joining and Welding

Cost reduction paramount in arc welding applications . . . Low silver alloy expected to cut brazing costs . . . Submerged melt method widely used in heavy industries . . . Research pushed

Resistance Welding Becomes Integral Part of Product Design

Fred H. Johnson, president, Progressive Welder Co., Detroit: "The first two postwar years of 1946-47 will probably go down in the history of the resistance welding industry as the years in which resistance welding finally came into its own. Although this method of fabricating had been used by some industries fairly extensively prior to World War II, it had been considered largely as an adjunct to other processes rather than a basic process around which to build a manufacturing layout.

"Today, we find the latter to be true in a rapidly increasing number of plants and industries. Two factors have been primarily responsible for this. The first of these was the recognition that rising production costs made it imperative to change assembly methods in such a manner as to produce more per machine hour and man-hour. This, moreover, had to be done without requiring greater skill on the part of the operator and without increasing his physical effort. Resistance welding provided one rather obvious answer to these requirements.

"The second major factor was that resistance welding has become more an integral part of product design. Acceptance of resistance welding as a desirable production method has led design engineers to improve their products so that they could be produced more easily and at lower cost by spot, projection, seam, butt or flash welding, or by a combination of various forms of resistance welding.

"As to equipment, the inevitable trend has been toward specialized engineering to suit the individual manufacturers requirements—taking into account type of product, production quantities and schedules, reduction of materials handling to the practical minimum, reduction in number of manufacturing operations, etc. Fortunately, resistance welding equipment developed prior to and during the war has made it possible to design such equipment without sacrificing flexibility and salvage value. Rare is the welding machine today which would have to be scrapped in large part in the event of a design or model change.

"One other factor should be mentioned. The development of lower cost and simpler 'stored energy' types of machines, such as the battery operated types, has made it possible to use resistance welding where it could not be used before: In localities where power supply would be inadequate to do the job with conventional welding machinery. This same development has advanced the application of resistance welding to new types of products, as for example, the flash-welding of structural sections of aluminum on a production basis."

Improved Dies and Machines Produce Low-Cost Fasteners

George A. Tinnerman, vice president and general manager, Tinnerman Products Inc., Cleveland: "Most recent development in metalworking in our plant has been the design of new improved dies and higher speed, production machines. The purpose of the new developments was to make possible the manufacture of a new line of spring-steel fasteners that could sell at prices actually lower than threaded nuts plus lock washers. This line, known as the C7000 series, embraces nuts to fit the ten most popular sizes of machine and sheet metal screws. Each nut in the series has been engineered to a precision formula based upon the diameter and strength of the screw with which it is used. As a result of our metalworking improvements, the nuts withstand higher torque tightening, are more compact, and provide greater tensile strength."

Cost Reduction Paramount In Arc Welding Applications

Robert E. Kinkead, consulting engineer, welding, Cleveland: "Industrial management is confronted with the same problems in cutting, welding and joining operations as in other technical matters. High wages and low unit productivity are the outstanding matters management has to deal with. Short of a major depression wages will not come down. Management has the tools to reduce costs, among which is better engineering.

"In the cutting field, methods have been developed for gas cutting stainless, using metallic arc and oxygen. Resistance welders are being built to make scores of welds simultaneously. Electronic engineers have removed the resistance welding bug-a-boo of large single phase loads by making possible a balanced 3 phase load with direct current supplied to the welder. Heliarc welding has been applied to stainless to make welds which require neither stripping nor grinding.

"In the general field of arc welding which is probably the largest in terms of number of operators employed, much remains to be accomplished. Ninety-five per cent of all arc welding is done by manual operators. So long as the labor unions can keep timing instruments from being used to record the amount of time production operators work, matter of increasing productivity will be difficult. Of course where submerged arc machines and those which feed covered electrodes may be applied substantial results can be obtained.

"Some users of arc welding have complained that the manufacturers of electrodes are too much concerned with bringing out new electrodes and not enough concerned with the main problem of how to get the manual opera-

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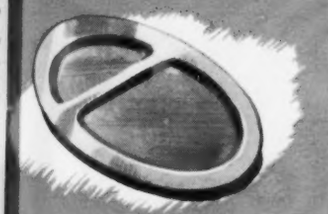

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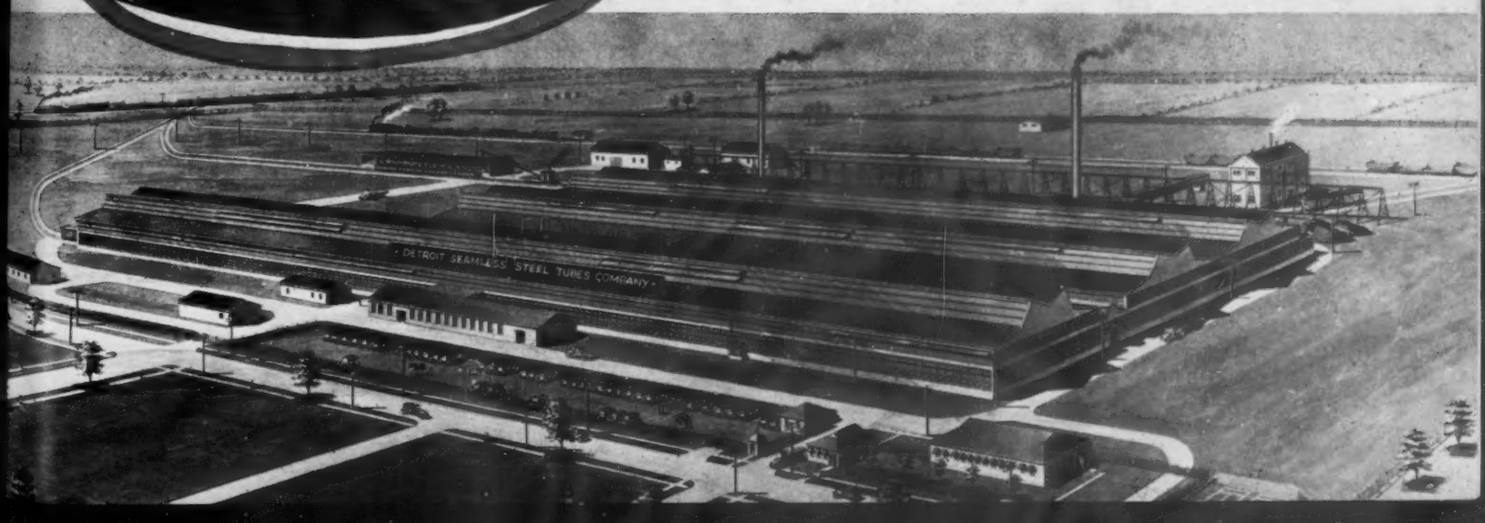

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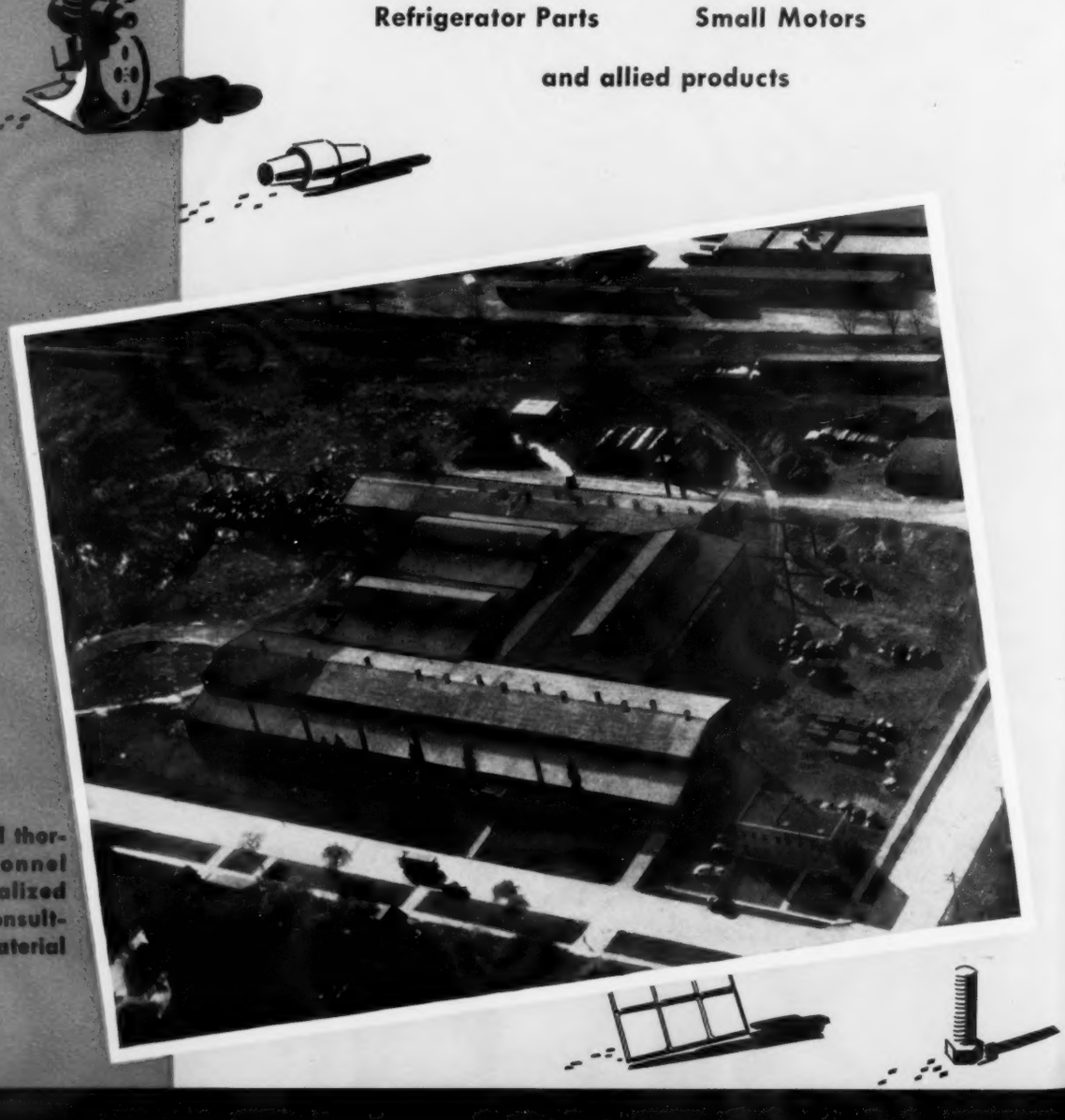


odern plant equipment and thor-ughly experienced personnel rovide facilities for specialized roducts and an adequate consult-g service to help solve material nd production problems.

tion reduced to a mechanical operation which will greatly increase the productivity per man hour. A 3 per cent improvement in electrodes which account for only 5 per cent of the cost certainly is not impressive to a management which is suffering from low output per man hour.

"In arc welding it may be expected in the immediate future that more extensive use of positioners will be made, also more special fixtures and more extensive use of self consuming electrode processes."

Submerged Melt Welding Used Widely by Heavy Industries

N. G. Schreiner, manager, Unionmelt Service, eastern division, The Linde, Air Products Co., New York: "The first postwar year witnessed large purchases of railroad equipment. In fabricating this equipment, the submerged melt welding process was used quite widely. Welding of locomotive boilers for services in the United States has just been permitted after a thorough test of a 1937 boiler, and after considerable wartime experience with partially welded boilers.

"The process is used on many joints of diesel locomotive frames and engine crankcases. Successful designs have been completed in which many joints can be submerged melt welded, eliminating much of the manual welding of the common design, thus decreasing cost and incidentally saving some weight.

"Car builders have expanded the application of the process to the car frame from the well-known welding of Z-bar center sills, to the fabrication of bolsters, and attachment of the various appurtenances to the center sills. Attachment of stakes to car sides and the fabrication of box-car sides by the process is common practice. Side sheets of passenger cars are commonly spliced by the process, but the attachment of these sheets to the posts and side framework is still a somewhat experimental project.

"Rebuilding worn parts and surfacing them for wear or corrosion resistance have been intensively studied in the laboratory and on field tests. In steel mills, worn edging rolls, table rolls, coiler rolls, and backing rolls have been built up with a resulting service life equal to or better than the original. Crane wheels, slag buggy wheels, mine car wheels, locomotive drive-wheel centers, and mine locomotive tires also are being rebuilt with satisfying results.

"Centrifugal casting of cast iron pipe deteriorates the mold, which formerly was reclaimed by manual welding the major defects or remachining to a larger size pipe. Since the number of remachining operations is limited, and since manual welding repair is possible only close to the ends, the mold soon has to be scrapped. Now, the entire length of the mold can be rebuilt by Unionmelt welding.

"Submerged melt welding also is used in the mass production industries. Domestic hot water tanks and range boilers, refrigerator compressor housings, small electric generator and motor frames and rear axle housings for automobiles and trucks are some of the products welded by this method. The demands of these industries for large volume of items accompanied by low unit costs and a minimum of rejects and down time are met comfortably by the use of the process.

"High-quality weld metal demanded in steam and diesel locomotives, many times proved by x-ray inspection and physical tests, can be easily obtained with the Unionmelt welding process. In the car building field, speed and economy of construction and lack of distortion are most important. This automatic process attains these requirements with resultant economy of manpower."

Oxygen Equipment To Speed Heavy Cutting Operations

A. M. Setapen, manager, engineering div., Handy and Harman, New York: "Elaborate study has resulted in two new low temperature silver brazing alloys containing 35 and 45 per cent silver and exhibiting properties equal to the widely used alloys containing 50 per cent or more of silver. These lower silver content alloys will enable manufacturers faced with the problem of joining parts to perform this operation at a much lower cost. The compositions are introduced to industry at a time when low temperature brazing for high-speed production is looked upon with increasing favor for joining stamped, cast, machined and forged parts.

"There have recently been developed certain alloys containing silver which exhibit high strength at elevated temperatures far beyond that of alloys more generally used. This should have an important bearing on the construction of jet propulsion and gas turbine equipment.

"In addition, in connection with high temperature brazing, there is a low silver content alloy presently being considered for use in atmosphere control brazing which would have certain advantages over pure copper, particularly from a temperature reduction standpoint."

Low Silver Content Alloy Expected To Cut Brazing Costs

R. S. Babcock, development engineer, The Linde Air Products Co., New York: "The cutting and shaping of large sections of steel has been greatly advanced through the introduction of new heavy cutting apparatus. This oxygen-cutting equipment permits mechanized operation with constant machine movement in the desired plane of the cut at higher speeds and lower gas consumptions than previously obtained with oxygen-lancing. The new apparatus uses oxygen and preheat gases supplied from pipe lines or manifold cylinders, and operates with oxygen pressures as low as 7 psi in cutting through 48-in steel.

"Processing time for preparing heavy machinery parts has been speeded up by rapid removal of scrap sections to facilitate handling, and by cutting the material close to the finish size so that minimum machining is required. The process also proved extremely useful in sectioning large steel ingots for metallurgical inspection, in producing square ends when large blooms are cut to length, and in removing hot tops from ingots shipped for subsequent processing.

"Steels of various analyses have been successfully cut at temperatures depending upon the characteristics of the materials. These steels include low-carbon steels at room temperature, medium-carbon and low-alloy steels at 500 to 1000° F and alloy forgings at 1000 to 1500° F. A hot top section was removed from an alloy ingot weighing 275 tons, whose cross section was over 5 ft thick, at a temperature of 1500° F and in less than 20 per cent of the time previously required for serving. Large quantities of scrap ingots and ladle skulls, which were previously dumped because there were no means of economically reducing

them to furnace charging size, are now being reclaimed by the heavy cutting process.

"This process, developed during the war to conserve manpower and ease the load on heavy industry, will be used to greater advantage in foundries, forge shops, shipyards, and steel mills in conserving and reclaiming material needed for the postwar era."

Combining of Controls Expands Resistance Welding Applications

G. W. Garman, control division, General Electric Co., Schenectady, N. Y.: "Principal advancement in General Electric's resistance welding machine controls, last year, was the design of a line to meet new NEMA standards which were adopted jointly by the Resistance Welder Manufacturers Association.

"The controls are designed for mounting on the right-hand side of the welder with control adjustors facing the operator. They also may be installed on the floor adjacent to the machine, or on a balcony with the control station mounted on the machine. To achieve these results, certain limiting dimensions were standardized in including the color of the enclosure to match that of the machine.

"In the preparation of these new standards the need was recognized for combining in a single unit controls that formerly were offered as separate items. For example, G-E's NEMA type N2 nonsynchronous spot welding control now combines in one unit an electronic contactor with a type 3B sequence-weld timer. The type S2H synchronous precision control combines in one unit an electronic contactor, a heat control, a synchronous precision timer, and a type 7B sequence timer.

"These standardized types now include six sequence and sequence-weld timers, six magnetic contactors with ratings from 50 to 900 amp, normal rating, three electronic contactors, and seven nonsynchronous spot welding combinations involving magnetic contactors, electronic contactors, sequence-weld timers, electronic heat control, voltage regulator, and current regulator. The synchronous precision combinations for spot welding, pulsation welding, or seam welding include thirteen standard types for power supply voltages from 220 to 600 v and some four high-voltage (series capacitor) types.

"In addition, the new standards include ratings of electronic and magnetic contactors, standard timing ranges, accuracy of timing and new definitions. The new control combinations, definitions and ratings should provide a better understanding of the application and use of resistance welding in metal fabrication. Installation will be simplified, and with resulting refinements in design, appearance and accessibility for servicing will be materially improved.

"An interesting application of electronic control during the year was the use of a current regulator with a synchronous precision spot welding control for the fabrication of railroad cars. By using a current regulator, numerous adjustments that were required previously, because of changes in the spacing of welding electrodes, were avoided. With the current regulator, only two adjustments were required, one for welding stainless steel and the other for welding Corten."

Importance of Designing for Resistance Welding Recognized

Henry Shore, director of research, Federal Machine & Welder Co., Warren, O.: "In the field of resistance welding the past year was a notable one for advances made in equipment and in a fuller appreciation of the importance of designing parts for resistance welding.

"Outstanding in the field of equipment has been the complete redesign and standardization of welding control panels by all major manufacturers. The new panels not only have superior performance, but have been reduced in physical size. Electronic type of construction has been incorporated, and has led to reduction and simplification of maintenance.

"Two new types of welders have been developed: One type is a press welder, which makes possible the resistance welding of tube to tube and forecasts tubular automobile frames, and the battery welder, which makes possible an alternative method of reducing peak power demand. Many ingenious multispot welders have been placed in service with enormous increase in production rates.

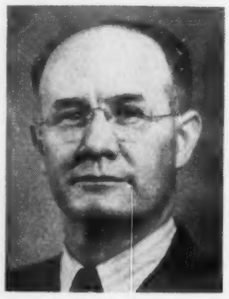
"Designing parts specifically for resistance welding has received considerable impetus by the issuance of two manuals, 'Recommended Practice for Resistance Welding' and 'Flash-Butt Welding,' by the American Welding Society. These enable engineers to solve problems in the first instance, rather than follow past practice of designing parts for other methods of fabrication, then attempting to have special resistance welders built to conform to the component parts to be welded.

"The past year also has seen the increasing use of resistance welders for materials hitherto believed to be outside the realm of resistance welding. Increased employment of resistance welding for aluminum, magnesium and high alloy steels has been noticeable, especially in heavier gages and cross-section.

"This year will see increased emphasis and activity in research and development. Research will be primarily concerned with the fundamental physical phenomenon and requirements of resistance welding. Under the aegis of the AWS and the Welding Research Council expanded research projects will be under way at Rensselaer, M.I.T., Columbia, Johns Hopkins, and in the industrial laboratories such as Battelle Memorial Institute. Fruits of this research will be a better understanding of the requirements and limitations of resistance welding.

"The development work in the direction of reducing peak power demand and design requirements, under the guidance of the membership of the Resistance Welders Manufacturers Association, will likewise be accelerated, while the manufacturers of welders will afford users of resistance welding equipment more complete design information, more efficient welders, higher production rates as well as automatic equipment for welding large intricate structures."

Automatic Welding Valuable in Highly Repetitive Production



C. P. Croco, manager, welding department, motor division, Westinghouse Electric Corp., Buffalo: "World War II really brought welding into its own; without it, the great Merchant Marine and Navy shipbuilding program could not have been completed. Many new uses of welding were developed and thousands of welders trained. The improvement in techniques and supply of trained workers has resulted in a great increase of weld-

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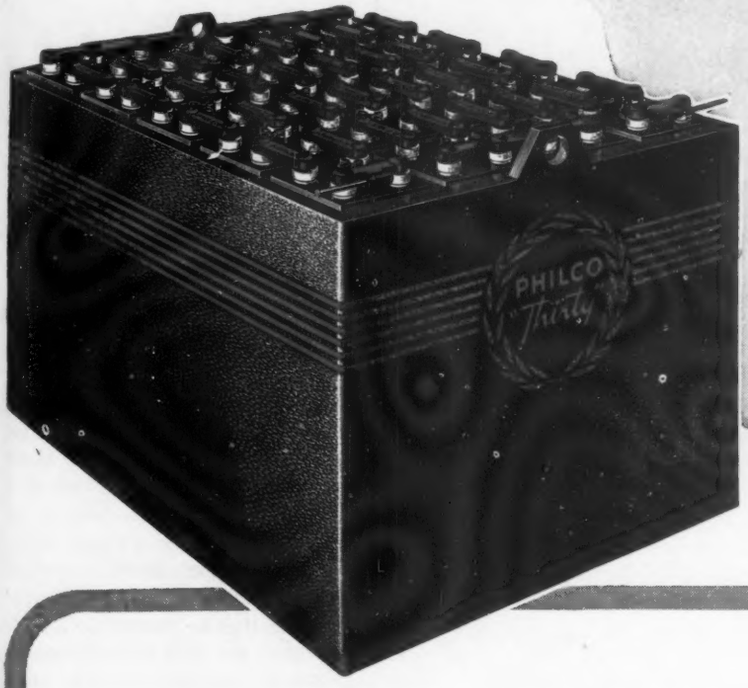

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ing in all lines of equipment during the period of reconversion. However, automatic welding, one of the most useful tools for metal joining, was not used to any great extent during the war because of the difficulty in obtaining equipment.

"The post-war manufacturer can ill afford to overlook this type of equipment, making possible welding speeds of from 30 to 60 and even 120 in. per min. as compared to 6 to 12 in. per min. by hand welding. Automatic welding equipment must be tailor-made for each application and special work-handling equipment must be supplied for each job. Only production of a highly repetitive nature can be automatically welded economically. The human element in welding is removed as a semiskilled worker can operate the equipment. Automatic welding is the answer for mass production in welded construction."

New Approach to High Strength Spot Welded Joints Indicated

J. Heuschkel, welding engineer, research laboratories, Westinghouse Electric Corp., East Pittsburgh, Pa.: "A new approach to the problem of establishing schedules for use in the economical production of high strength spot welded joints in low carbon steel for thicknesses up ½-in. has been developed. Existing standards did not provide information on spot welding the heavier sections nor for making closely spaced welds in the thinner sheets as may be required for high strength joints. Data obtained from the making of single weld specimens were found to be inadequate for these purposes. Because the schedules required might influence timer control capacities a comprehensive study of the entire subject was undertaken.

"Attention was focused upon a means of rationalizing the required interrelationships of weld ingot size, strength and spacing and then the necessary welding conditions were determined. The relative strength of the spot weld with respect to the strength of the unwelded sheet was first obtained. The most effective weld button diameter from the viewpoint of maximum unit average stress developed at failure was next investigated.

"For a pre-fixed weld size-spacing condition the spot welding conditions were found by determining the necessary force-electrode-current-time conditions, in that order. The final interrelationships were given in specific mathematical terms, and the values were summarized for use in tabular form. Results of proof tests made on joints containing from five to 40 spot welds per joint were given. It was found that the full strength of the unwelded material could be developed with a single row of spot welds, which need not be spaced edge-to-edge. The welded joints were made with existing equipment."

Arc Welding Research To Increase Metal Fabrication

A. F. Davis, vice president, Lincoln Electric Co., Cleveland: "The fact that during the war arc welding played a leading role in the production of ships for the Navy and the merchant marine is now known by all of us. One shipyard, for example, set a record of launching a vessel, completed from keel laying to erection of superstructure, in 4½ days. By the same token, planes were soaring on military missions in unheard of time. Tanks and other vehicles were welded in the later days of the war when it was learned that this method was the fastest and most practicable means of fabrication.

"Now, in the post-war era, the production lines of our nation must again speed on at an unprecedented rate, for the needs and creature comforts of our populace are critical, due to the five long years of war in which victory was the only thought on the minds of everyone. The needs of automobiles and appliances and other common necessities are urgent, and these items are being turned out as rapidly as possible under current circumstances. This conversion to a peacetime economy is being heralded by newer and faster means of metal fabricating—electric arc welding.

"Not only does the trend in arc welding involve the adoption of this process in place of other methods in the processing of metal into finished products, but its very inherent advantages coupled with steel have lead to the increasing uses of steel in the manufacture of various products which were previously fabricated of other materials, such as wood and concrete.

"As the uses of arc welding continue, the manuafacturers of this equipment are furthering research in this line to widen its use in all fields of industry and science. These manufacturers are developing new welding machines, electrodes and accessories almost daily, and give promise of furthering at this rate the revolutionary increase in metal fabrication.

"No report of arc welding and its relation to the world of industry today would be complete without some mention of the James F. Lincoln Arc Welding Foundation's $200,000 Design-For-Progress Program which was announced this past summer. This program, stimulating an hitherto unknown interest in the minds of thousands who previously had no professional relationship to welding, is bringing new theories through new interests to the field of arc welding that will extend and broaden its uses in widespread advantages to industry."

Lime-ferritic Electrodes Adaptable for Difficult Welds

Orville T. Barnett, division engineer, Electrode Division, Metals & Thermit Corp., New York: "Although considerable general progress was made in metallic arc welding during 1946, there are three specific fields in which the practice was forwarded: The introduction of lime type electrodes for general welding applications, the development of chromium molybdenum electrodes to inhibit graphitization in power piping installations and the postwar emergence of the E6012 electrodes as the most popular single grade.

"The new lime ferritic electrodes became available in an unalloyed mild steel type and in a number of special alloys for unusual welding applications. Among the achievements attributed to the widespread use of lime-ferritic electrodes is listed the ability to weld on the following types of hitherto diffucultly weldable base metals: High carbon, high sulphur, enameling stock and steel castings.

"Chromium molybdenum electrodes based on four types of coating, namely, the XX1O, XXX11, XX13 and lime-ferritic, were adopted for power piping work where the high temperatures of operation were liable to bring about a dangerous amount of graphitization. Chromium was added to the molybdenum bearing electrodes formerly used for such work because the chromium inhibited

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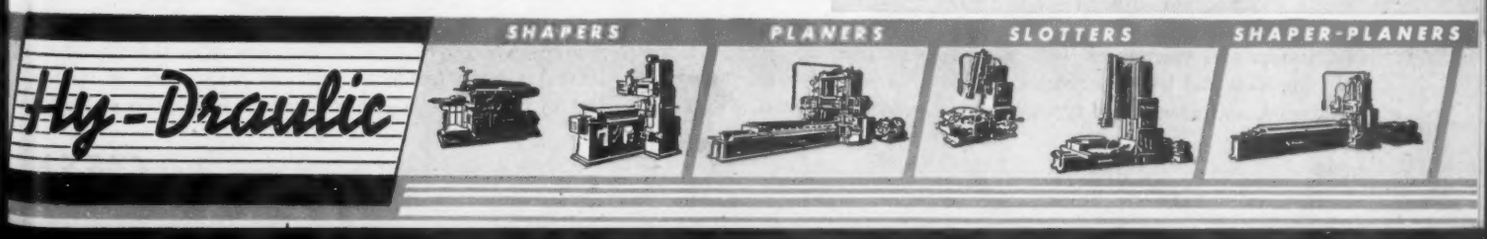


graphite formation. Chromium contents varied from ½ to 3 per cent, with molybdenum contents of either ½ or 1 per cent.

"The bulk of welding applications was formerly done with the E6010 electrode type. Following the war, the trend away from this type to the E6012-E6013 group became pronounced until the E6012 electrodes are now more widely used than any other single grade. One estimate places E6012 electrode consumption at 60 per cent of the total used."

Low Alloy Electrodes Continue Development

C. I. MacGuffie electric welding division, General Electric Co., Schenectady, N. Y.: "The year 1946 saw further substantial expansion of the electric arc welding industry. Development work started many years ago in the field of arc welding aluminum without flux has borne fruit in many successful commercial applications of this process.

"Continued development of electrodes in the low alloy field resulted in widening the practical application of this process. New electrodes now make possible the fabrication of formerly hard-to-weld metals such as high-carbon steels, free-machining steels, cold-rolled stocks, etc., and chrome-stabilized carbon molybdenum steels. Refinement in design and manufacture of electrodes raised the standard of quality, particularly in the stainless steel fields."

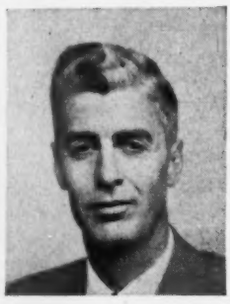
Continues Extensive Research On Pressure Vessel Fabrication

Fred L. Plummer, director of engineering, Hammond Iron Works, Warren, Pa.: "The extensive research program now being conducted by the pressure vessel research committee of the Welding Research Council marks a significant attempt on the part of representatives of steel manufacturers, fabricators and erectors as well as those of inspection and testing agencies, design engineers, and users of all types of process and storage vessels, to secure basic information that will make possible the construction of economical vessels of assured safety under the wide range of service conditions to which such vessels are now generally subjected. This program is divided into four major divisions covering: Materials, design, fabrication, and inspection and testing.

"The very small number of service failures which occurred during the recent war period gave powerful evidence of the general adequacy of design, fabrication and erection procedures used by most manufacturers. However, the few failures which did occur have caused engineers to review the designs of certain details. Tubular columns are now generally favored for large vessels such as spheres or cylinders with cone or dished bottoms and roofs, when such vessels contain liquids.

"Column attachments are designed to provide a maximum of flexibility and a minimum of sharp discontinuities. The use of heavy sheared plates rolled to a small radius as necks for manhole or other openings is not considered good practice unless the edges of the plates have been planed or ground smooth to avoid the possibility of incipient cracks. Greater care is being exercised to avoid excessive 'reaction stresses' due to welding."

Use of Welding in Construction And Maintenance Increases



D. H. Corey, welding engineer, Detroit Edison Co., Detroit: "The shortage of equipment and materials, such as steel, available for civilian use throughout the war period resulted in a marked increase in the utilization of welding as a construction and maintenance tool in the industry. The experience thus acquired is now serving the industry well in the postwar period of shortages.

"In the fabrication of new equipment, it appears that alloy steels are being used to a greater extent than heretofore. Operating experience at the present high level of pressures and temperatures utilized in steam-electric stations, has disclosed shortcomings in some of the materials that had long been accepted as adequate. Additions of chromium, in particular, to such parts as pump castings and water regulating valves subject to corrosion or erosion, and to high temperature piping as a preventative against graphitization, seems to be accepted.

"Electrodes for welding practically all of the newer compositions are readily available. Although these alloys are weldable, in the broadest sense of that term, they are not as foolproof as the plain carbon steels. Refinements in the welding procedure, and particularly careful attention to such matters as preheating and postweld heat treatment is required. The objective, of course, beyond that of obtaining sound welds, is to minimize the metallurgical damage incident to the welding operation, and where damage to some extent is unavoidable, to restore to the fullest practical extent, the original qualities of the base material."

Training Welding Mechanics Essential to Conversion

Walter J. Brooking, dean, LeTourneau Technical Institute, Longview, Texas: "In the field of welding, technical men expect during 1947 to see a marked increase in the application of arc welding to the production of peace time goods.

"An essential step in the conversion of our nation to the production of welded peace time goods is the training of better welding mechanics. Because of the frozen designs and prodigious numbers of each type of gun-base, tank, or ship, war time production workers were trained almost exclusively as welding operators. Conversion to normal peace time production requires that more workmen be welding mechanics, capable of doing a wider variety of welding work than simple operating.

"Only with the training of more welding mechanics will the real advantages of arc welding, as demonstrated for war, make their full contribution to our peace time production. Heavy emphasis is therefore being placed on training the welding personnel in manufacturing organizations in the elements of welding engineering and production control. Great progress should be made in 1947.

"One source of obtaining some of this important educational training is certain to be found in co-operative training programs of industry with the numerous technical institutes which are in operation—many of which have been activated

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during and since the war. By realistic training on the job in a co-operative educational program, closely correlated with the classroom work of a technical institute, modern young mechanics in welding can get educational experience which they can get in no other school program on so practical or effective a basis."

Welds in Cast Iron Improved By Using Special Electrode

E. V. Ivanso, Steel Sales Corp., Chicago: "A new type of arc welding rod called 'Ni-Rod', recently developed by International Nickel Co., has practically eliminated all welding problems in plain and alloyed cast irons. Uniformly excellent results have been obtained in repairing damaged or broken castings, in building up worn areas and in repairing defects in new castings.

"In many cases, sound, machinable welds were produced without preheating the casting. In other instances—in heavier castings and those having shapes conducive to developing high internal stresses during welding—preheating insured excellent machinability and freedom from cracking, either in the deposited metal or in adjacent cast iron.

"The arcing characteristics are excellent, and arc stability, fluidity, and resultant bead contours are outstanding. All tendencies toward cracking are overcome by the smooth flowing characteristics and inherent ductility of the deposited metal."

Inert Gas Shielded Arc Welding Technique Well Established

H. T. Herbst, development engineer, The Linde Air Products Co., New York: "About four years ago inert gas shielded arc welding was introduced to provide a much-needed means of welding magnesium. With the direct current, reverse polarity, then used, the process was practically limited to light-gage fabrication. Subsequent use of direct current gave very satisfactory results in welding a great many metals and alloys other than magnesium and aluminum. High frequency stabilized alternating current, introduced about 3 years ago, made possible welding aluminum with practical conditions.

"During the past year, proper technique has been well established. The problem of rectifying alternating current in welding aluminum was of major importance in early 1946. Improved technique, together with improved torch design, have largely, from a practical viewpoint, disposed of this problem. This has lead to the application of the process at many points on aluminum pressure and storage vessels up to and including ⅝-in. in thickness. Test welds have been satisfactorily completed on aluminum in thickness up to 2½-in.

"For 18 months, torches for operation up to 250 amp have been available in quantity. A limited number, suitable for welding current up to 500 amp, has been available for a few months.

"Use of maximum welding current in production applications has had remarkable growth in the past year. At the beginning of the year applications with more than 150 amp were extremely rare. By the end of the year, increased production was carried on with welding currents up to 500 amp. It is anticipated that by the end of 1947, this figure will approach or even surpass the 800-amp mark. This will allow fabricators to use the process on stainless steel up to about ½-in. plate, on ¾-in. Everdur, and on aluminum around 2 in. thick."

Trend in Resistance Welding Now Toward Simplification

E. H. Vedder, manager, resistance welding engineering, motor division, Westinghouse Electric Corp., Buffalo: "During the war, a high percentage of the materials to be joined consisted of aluminum and hard-to-weld alloys of all kinds. This required precision—precision in machines and control. Even mild steel was welded with precision apparatus to get higher quality joints. A tendency was also exhibited to use the most elaborate apparatus that might possibly be desirable so long as public money was being used.

"Now there is a sharp trend toward simplification, and return to normal practices. This results in more purchases of nonsynchronous control, and less of synchronous and energy storage control. Aluminum welding equipment already available is more than adequate to do all necessary welding of this material. Little new apparatus of this type is being produced.

"Manufacturers of resistance welding control now are combining all control functions into one cabinet arranged for mounting either on the welding machine or on the floor. Various functions are segregated into subassemblies which are plug connected. The new designs provide a completely factory assembled and tested control which has greater convenience for installation and servicing than ever before."

Low Boiling Point of Liquid Nitrogen Aids in Shrink Fitting

R. E. Bludeau, development engineer, The Linde Air Products Co., New York: "The use of high purity liquid nitrogen for shrink fitting assembly operations is rapidly gaining recognition in the machine industries. It is being used with success in the assembly of such items as automotive valve seat inserts, motor shafts, bushings and sleeves.

"Because of the low boiling point of liquid nitrogen, (minus 321.4° F) extreme metal shrinkage is possible. Low carbon steel has a total contraction from room temperature (plus 75° F) to liquid nitrogen temperature of 0.0022-in. per inch. High purity liquid nitrogen has the additional advantage of being inert and noncombustible. Users are supplied with liquid nitrogen in vacuum insulated portable containers which range in size from a few liters up to large but extremely portable servicing containers which hold 100 gal.

"Special equipment has been developed to dispense the articles to be chilled. In some cases, this equipment is either completely automatic, or semi-automatic in operation. Through the use of a novel but completely scientific arrangement, chilling is accomplished by utilizing the latent heat of the liquid and the specific heat of the gas. This principle allows for precooling of parts, which results in very economical use of the nitrogen. At the same time it permits delivery of a sub-zero chilled part

Metal Production

Beneficiated raw materials mark beginning of new era . . . Modification of electric steel practice imminent . . . Consider washing metallurgical coals . . . Use of oxygen in open-hearth promising

Statistics Disclose Upswing Of Foundry Iron Production

R. H. Sweetser, Consultant in Blast Furnace Practice, 7 Mitchell Place, New York: "A considerable upswing in the proportion of foundry pig iron produced by the blast furnaces of the United States occurred in 1946. Since 1900 foundry pig iron had steadily decreased from 24 per cent of the total (3,311,140 gross tons out of 13,789,242 gross tons) to the low point of only 3.39 per cent in 1943 (2,059,501 net tons out of 60,810,670 net tons). The percentage of foundry iron for the first nine months of 1946 was 6.26 per cent (1,975,771 net tons out of 31,582,157 net tons). During the five war years (1941-1945) the tonnage of foundry iron was only 4.10 per cent. For the ten years previous to 1941 it was 7.84 per cent; for the ten years beginning 1921 it was 13.84 per cent, and in 1910 it was 18.8 per cent.

"The peak tonnage of foundry pig iron in this country was 6,248,611 gross tons in 1923, the first year that the blast furnaces of this country reached the 40 million mark (40,361,146 gross tons, 15.5 per cent of which was foundry).

"For the three years beginning with 1943 the tonnage of malleable pig iron was greater than that of foundry, but in 1946 the proportion of foundry has been the greater. These two grades of merchant pig iron have amounted to 10.88 per cent of the total production for the first nine months of 1946.

"The year 1946 saw the omission of the tonnage of charcoal pig iron produced for the first time since pig iron statistics started; this tonnage is no longer announced by the American Iron and Steel Institute because only one charcoal blast furnace remains."

Coke Testing Methods Require Correlation with Furnace Data

C. W. Stahl, engineer, Research Section, Development and Research Department, Bethlehem Steel Co., Bethlehem, Pa.: "During the past year one of the most discussed subjects before the coke oven fraternity was the question of the testing of coke. Numerous standard chemical and physical tests are made on metallurgical coke, but no specifications exist which define the properties required in the furnace.

"An ideal metallurgical coke has been described as one having high strength, good sizing, low ash and sulphur, and one in which none of these properties vary. Such a definition is too general. The exact evaluation of coke quality can only be obtained from a study to determine if the quality test data can be correlated with furnace practice.

"In making such a study, representative samples of the coke charged must be obtained at the blast furnace, and all other materials entering the furnace must be adequately measured and sampled so that changes in operation due to fluctuations in these materials may not be ascribed to the coke.

"Chemical tests of coke ordinarily made are proximate analysis, sulphur and ash; occasionally, fusion point of ash, phosphorus content and ultimate analysis. The physical tests include drop shatter, tumbler tests of various kinds, screen analysis and density.

"Producers consider the ASTM tumbler stability index to be the most significant in evaluating coke strength.

"A modification of the ASTM shatter and tumbler tests has been developed which is believed to give a more significant analysis of coke strength. In these tests the standard operations are carried further. It has been observed that some cokes which show superiority in the standard tests actually give greater degradation with the modified tests.

"In the modified shatter test the sample of 50 lb is dropped from the shatter box a total of eight times, with screen analyses being made after the second, fourth and eighth drop. From these results a rate of degradation can be plotted. In the modified tumbler test the 22 lb sample is rotated 3000 times and screen analyses made after 1000, 2000 and 3000 revolutions.

"The true value of any new or modified methods of testing cannot be obtained without correlation studies with blast furnace practice over an extended period of time."

Steelmakers Consider Washing Of Metallurgical Coals

C. D. King, Chairman Operating Committees, U. S. Steel Corp., Pittsburgh: "Apart from the problems universally confronting operators in maintaining output in the face of continued interruptions, as well as shortages of metallics, some technical and operating questions are engaging the interest of the pig iron and steelmaking fraternity.

"Inroads on high-quality metallurgical coals for coke have expedited consideration of coal washing plants. In some districts this has brought with it increasing percentages of sulphur in the raw or beneficiated coals, posing problems to the blast furnace operator which still remain unanswered. Some operators are engaged in desulphurization of various forms, some of which appear to possess attractive possibilities if the operating problems involved are surmounted. In addition, the use of high top pressures is also proving of considerable interest to blast furnace operators. Continued studies are also being made of the preparation of ores and improvement of the burden structure. Use of oxygenated air also is a matter of more than academic interest to blast furnace operators and management.

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erable experimental work is now under way using oxygenated air for combustion with noteworthy results. At some plants the use of oxygen as a means of accelerating the carbon drop in the bath is also being tested. Some large scale investigations are under way employing greater usage of basic brick, including, at least in the case of one plant, the consideration of a complete basic furnace. Continued studies of improved charge ores engage the attention of many operators. More precise control of steelmaking operations is evidenced by continued cooperation between metallurgists and operators."

Abundant But Little Used Metals Would Greatly Relieve Scarcities

Zay Jeffries, vice president, General Electric Co., Pittsfield, Mass.: "Increased production of most any metal will relieve the strain on scarcer metals. Increased use of iron, aluminum and magnesium should be stimulated and will be helpful, but it is not enough. A greater future supply of some of the more abundant, but less used metals and near metals would provide additional relief.

"For example, manganese is sufficiently plentiful to support a large manganese base alloy industry. This development is now barely started. Certain other elements, like silicon and titanium, could be produced in unlimited quantities; if metallurgical science can tame them and adapt them to man's needs. Chromium and zirconium are relatively plentiful and both need more future attention. Metals like calcium and sodium, available in unlimited quantities, also offer challenges to the metallurgists.

"If we visualize such a campaign against the background of metallurgical history, the outlook is not too discouraging. In the first place, there will be a continuing supply of all the metals, the scarcer ones included. We may expect new ore finds of importance and then there are, in most cases, large deposits of low grade which can be worked at a price. Improvements in mining, milling and smelting can be confidently counted on to make the working of lower grade deposits economical. So, the time allowed for making the developments necessary for greater use of some of the milder but more abundant metals is long, and the advance in metallurgical science is rapid. We can face the future, therefore, with the faith that metals, if properly used, will provide a firm foundation for a much higher standard of living and more worldwide than anything experienced in the past."

New Powdered Iron Core Materials Developed

C. T. Martowicz, engineering department, Henry L. Crowley & Co. Inc., West Orange, N. J.: "A significant advancement has been made in the production of carbonyl iron powder having a lower carbon content than heretofore available with a resultant improvement in molding and electrical properties.

"Of equal importance in the field of electrical grade iron powders is the successful preparation of spherical permalloy powders in various particle sizes ranging from 2 to 25 microns. These materials when properly compounded with inorganic binders and annealed after molding exhibit at high frequencies magnetic characteristics not obtainable with ordinany high-grade iron powders.

"The development of new and different materials such as nickel-iron carbonyl alloy powders is expected in the near future, as a further contribution to the widely expanding electrical powder field."

Precision Mill To Cold Reduce Stainless To Close Tolerance

F. G. Gerard, vice president in charge of operations, Washington Steel Corp., Washington, Pa.: "MicroRold will be the trade name of the stainless steel product coming off the new precision mill which is scheduled for full-scale operation in February. The mill is designed to cold roll stainless steel sheets and strip up to 36-in. widths and from 0.078-in. to 0.004-inch thickness and in commercial finishes and tempers.

"Tolerances will be held to 0.001-in. throughout the entire length and width of the product. Considerable cold reduction will be done without intermediate annealing and descaling. The flow line of the plant is continuous, thus obviating unnecessary handling and moving of material. Material handling will be accomplished through use of overhead cranes, lift trucks and conveyors.

"Expanding applications for stainless steel are seen in the food processing, dairy, beverage, textile and paper industries; chemical processing; laundry, hotel and restaurant equipment; architectural trim and transportation industry."

High-Temperature Alloys Formed On Equipment Used for Stainless

C. G. Chisholm, Haynes Stellite Co., Kokomo, Ind.: "During the past year one of the most important improvements in the production of Hastelloy alloys was in rolling the alloy to obtain larger sheets, particularly lighter gages required for aircraft work. For example, methods were improved for rolling alloy C to light gage sheets down to thicknesses of 0.025 in. with dimensions as large as 36 x 96 in. In the past rolled sheet was limited to sizes of 0.025 in. thick with dimensions of 22 x 40 in.

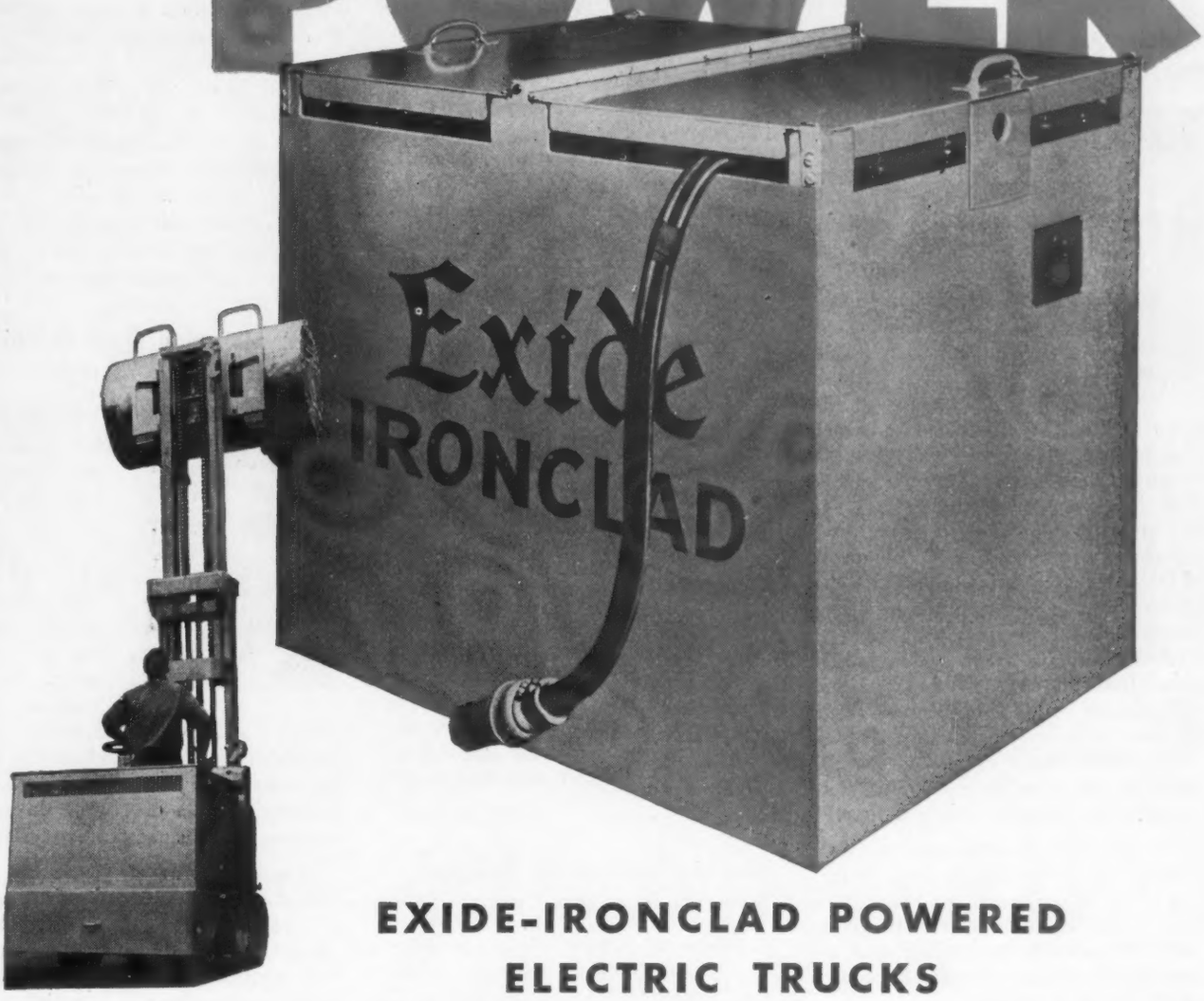
"Within recent months it has been possible to roll alloy C into hot rolled bars with diameters varying from 3 in. down to 5/16-in. and subsequently to draw it into small wire.

"Formerly Hastelloy alloys were pickled by regular commercial methods. This proved entirely inadequate because of the high corrosion resistance of the alloy and the tenacity of mill scale. Within recent months the Hooker Virgo salt bath pickling process has been adapted to these alloys, and sheets and bars were pickled satisfactorily.

"Hastelloy alloy strip has recently been cold rolled to a limited scale with very promising results. Small-diameter alloy B seamless tubing has been successfully drawn. The tubing now can be supplied in diameters of under 1 in. Small-diameter welding tubing also can be drawn in three grades of Hastelloy alloy; namely, A, B, and C. Hastelloy alloy is now more easily worked because of improved foundry and metallurgical practices.

"It was formerly difficult to deep-draw, press and spin these alloys, but within the past year improvements have been made with fabrication procedures, so that such work can now be performed. Heliarc welding as well as various resistance welding techniques, has been adapt-

DEPENDABLE POWER



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CUT MATERIAL HANDLING COSTS

More and more industries are adopting the modern method of materials handling. They are giving the job to the efficient, time-and-cost saving electric industrial truck, which keeps goods moving fast at a steadier rate, with greater safety and at considerably reduced costs.

There are battery-electric trucks for every lifting, hauling and handling task. And for each there is a powerful Exide-Ironclad to assure peak performance with full shift availability. Because of their dependability, long-life and ease of maintenance, Exide-Ironclads are used in a majority of all electric industrial trucks.

Write for a FREE copy of Exide-Ironclad Topics which contains "Case Studies" of materials handling problems. Tells how to cut handling costs up to 50%... covers latest developments in handling materials from receiving to shipping.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

ed to light-gage sheet with particular success.

"With closer foundry and metallurgical controls, these alloys now can be designed for forming, with the same equipment generally used for stainless steel and other high alloys."

Modification of Electric Steel Practice Under Consideration

M. V. Healey, Schenectady Works Laboratory, General Electric Co., Schenectady, N. Y.: "Standard basic electric steelmaking consists essentially of three phases or periods: melting, oxidizing, and reducing. The purpose of the melting period is to convert the solid charge to the molten state. The purpose of the oxidizing period is to remove dissolved neutral and reducing gases by boiling. The purpose of the reducing period is to remove some of the oxygen left from the oxidizing period. Beyond the instances where it is used to recover oxidized alloying elements from the slag, it is believed that the reducing period is of negative value. It constitutes an opportunity for the gases, which were eliminated in the oxidizing period, to be re-absorbed. Furthermore, it is time-consuming and costly.

"If the basic electric practice were modified to the extent that the reducing period is eliminated, we would then have a practice similar to that used in basic open-hearth steelmaking and the product should be comparable to that of the latter in quality.

"Experiments to date indicate that such a practice is feasible and can accomplish the desired result. It should be classified as: "No slag off—tapping under an oxidizing slag."

Sintering Plant Installations Now Involve Two Machines

W. J. Urban, engineer, American Ore Reclamation Co., Chicago: "Benefits of sinter in the blast furnace burden received prominent attention during the past several years when the maximum possible production of pig iron was required. This led to the construction of a number of plants with an output exceeding any of those previously built. One plant built has a capacity of about 5000 tons per 24 hours. In the past the majority of sintering plants treated the fines from high-grade hematite ores. But in recent years large plants have been erected to treat the lower grade southern ores, magnetic concentrates, and the newly developed western ores.

"Many of the latest sintering plants have two machines of the largest size and were built to sinter fines resulting from crushing and sizing raw ore. New problems in design were presented in regard to distribution of raw materials to the two machines and disposition of the hot sinter. These problems have been overcome in different ways in different installations, each of which has its merits for the particular installation. In the new western installations cooled sinter is handled on belt conveyors.

"Proportionate distribution of the same raw materials to two or more sintering machines has been made by various devices. Alternate distribution at short intervals into small surge hoppers has proved satisfactory providing the material in the surge hopper is kept to the minimum. Careful attention by the operator is required. Dual bins, feeders and conveying systems have been used for two machine sintering plants. This, in effect, is two independent plants, the cost of which is high as compared to a single system.

"It is expected more sintering will be done as high-grade ores are replaced by the marginal ores and on a much larger scale than is now prevalent at blast furnace plants. Facilities for handling materials will be much larger and will require less labor and maintenance per ton."

Use of Aluminum as Building Material Increases During 1946

David P. Reynolds, vice president, Aluminum Division, Reynolds Metals Co., Louisville: Aluminum, during the past year, received popular recognition as an outstanding material for building products. Literally millions of pounds daily have gone into this one use for aluminum. There is hardly a locality in the country that cannot boast of a structure covered with aluminum sheet. And where aluminum itself has not been available, users have gone to aluminum paint—especially on roofs—for the added coolness afforded by the high reflectivity of these coatings.

Transportation people are evincing interest in knocked-down all-aluminum truck and trailer bodies. Likewise several railroads are running operational tests on new refrigerator cars and other units made of aluminum. In addition, aluminum furniture developed to determine marketing possibilities, revealed an unusual amount of public interest. Kitchen utensils consumed a large portion of aluminum, one plant alone producing more than 55,000 units daily. Aluminum pallets for economical shipping of palletized loads are now going into mass production to meet the demand for this item. Investigation of a number of other uses for aluminum resulted in plans for mass production of a wide variety of other items of aluminum ranging from toys to small boats. At the beginning of 1947, our yearly capacity figures stand as follows: Alumina — 1,755,000,000 pounds; aluminum—380,000,000 pounds; sheet — 432,000,000 pounds; extruded shapes — 45,600,000 pounds; extruded tubing — 32,400,000 pounds. Reynolds Metals Co. now operates 57 plants in 18 states and 4 foreign countries.

Powder-Scarfing Is an Aid to Stainless Steel Production

D. H. Fleming, development engineer, Linde Air Products Co., New York: "The advent of the powder-scarf-process within the past year brings to the stainless steel producer a tool which will permit higher production rates per man-hour at lower cost than older methods of mechanical conditioning at a time when the use of stainless steels is rapidly expanding.

"The main part of the process consists of introducing a combustible metallic powder into the cutting-oxygen stream. The burning powder removes the refractory chromium oxide formed in the reaction zone by a combination of melting and fluxing, thereby permitting a scarfing action similar to that obtained on carbon steel.

"In the primary conditioning of stainless steel ingots and particularly of bloomdowns and large billets, deep cracks and corner tears make grinding an extremely time-consuming and laborious operation. By powder-scarfing, these large sections are prepared eight to ten times as fast. Furthermore, material formerly considered scrap, because of the excessive time required by grinding, can now be easily reclaimed with attractive savings and rolled to a finished product.

"The powder-scarfing process has its greatest potential use in the conditioning of slabs and billets prior to final rolling. Speed can be increased two to three times with single blowpipe hand operation. Even greater speed increases are expected upon mechanization of the pro-

You're looking at a saving of $199,680!

Compare...
BAR STOCK
Weight per foot: 6.835 lbs.
Machining: 40 sec. per unit
TUBING
Weight per foot: 1.795 lbs.
Machining: 10 sec. per unit
Total amount of stock used, 690,000 feet.
Total estimated savings in material amount to $49,680. Savings in machining time are estimated at $150,000.
(Actual part not shown at request of manufacturer.)
BAR STOCK
TUBING

HERE'S an actual cost comparison—based on figures from the records of a company which in 1935 converted from bar stock to Timken seamless mechanical tubing for making tubular parts.

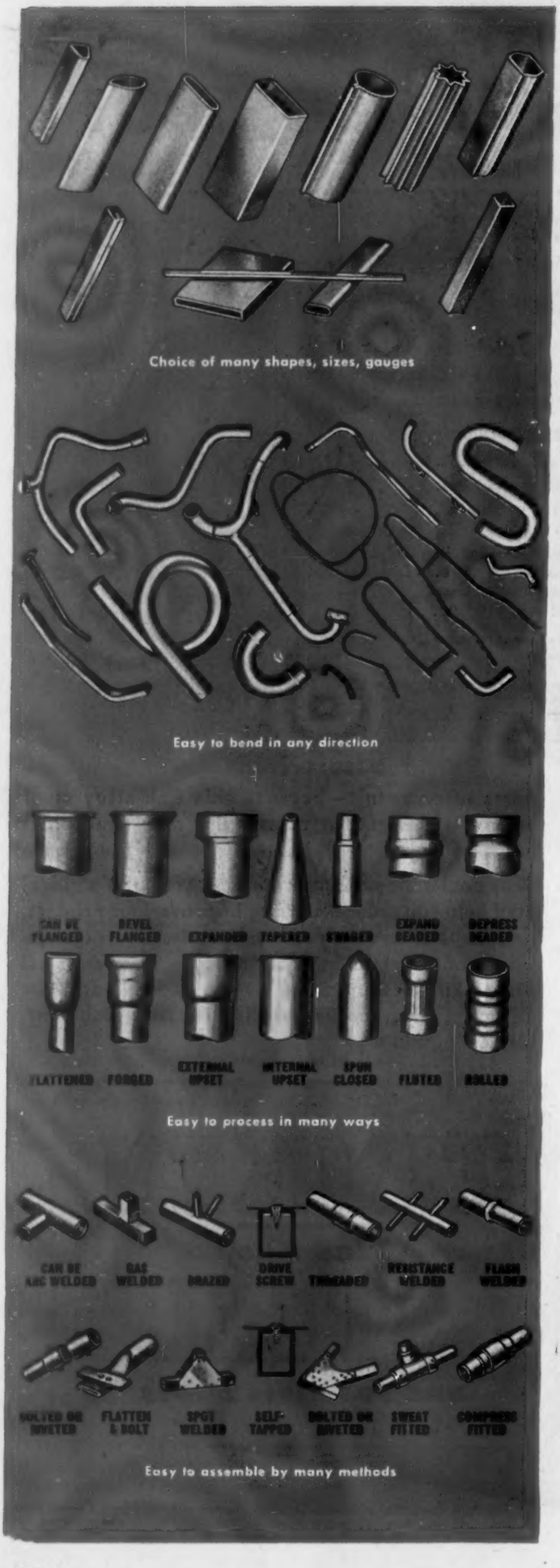
By their own accounting, Timken seamless tubing has saved them—in material and machining time—$199,680!

Machining tubular parts from Timken seamless tubing eliminates drilling, reduces scrap and speeds production. And you'll find higher *quality* parts often result—because this fine alloy steel tubing is tailored to exactly the size, grade and finish you need.

Why not let the skill and experience of our Technical Staff help you reduce costs, or improve your product, or *both?* For an "on-your-job" analysis (no obligation) and our free booklet "Timken Seamless Steel Tubes, Finishes and Sizes", write to Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

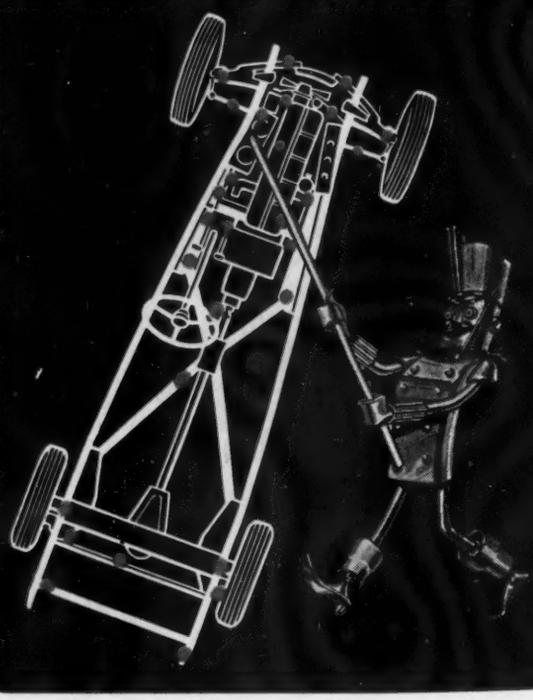
YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.



MORE and MORE

"Standard" Shows the Way to More Tubing Uses . . .



For Example: The Standard Tube Company, leading specialist in electric welded steel tubing, is working with more and more manufacturers in the automotive field to help simplify designing, fabricating and assembling processes for greater economy. "*Standard's*" variety of tube shapes, sizes and gauges—available in carbon steels, stainless, and N-A-X high tensile steels—are daily proving more advantageous for new uses . . . not only in the automotive industry, but also in countless other industries.

As shown at left, you can easily bend "*Standard*" tubing, change its cross section, and assemble it by many methods. Perhaps we can help *you* figure a more profitable production method, by using "*Standard*" . . . the *quality* tubing with a weld of the same uniform strength, and physical characteristics, as the tube wall itself!

Standardize with "Standard"—It Pays!

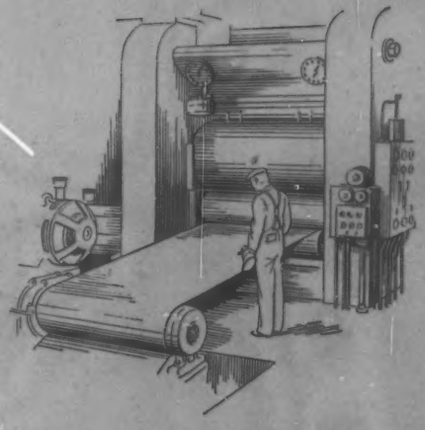
THE STANDARD TUBE CO.
Detroit 3, Michigan
Welded Tubing
Fabricated Parts
STANDARD
STANDARDIZE with "STANDARD"—It Pays

★ *Complete Tube Stocks Maintained by* ★
STANDARD TUBE SALES CORP., One Admiral Ave., Maspeth, L. I., N. Y.
LAPHAM-HICKEY COMPANY, 3333 W. 47th Place, Chicago 32, Ill.
UNION HARDWARE & METAL CO., 411 E. First St., Los Angeles 54, Cal.
THE PACIFIC PIPE COMPANY., 160 Spear St., San Francisco 5, Cal.

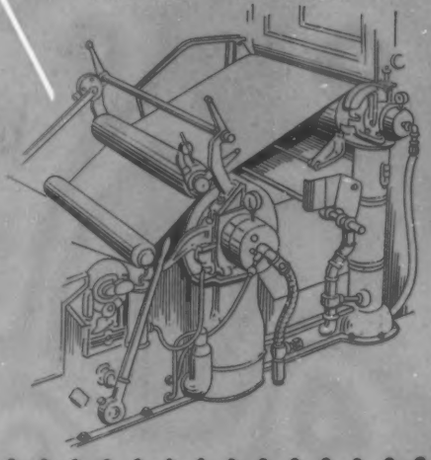
THE SHEFFIELD MEASURAY

MEASURES THICKNESS CONTINUOUSLY WITHOUT TOUCHING THE WORK

METALS
Sheet · Strip · Foil



RUBBER · PLASTICS
COATED FABRICS
FILMS · PAPER



Problems inherent in contact gaging of continuous strip materials are completely eliminated by the installation of the Sheffield Measuray. *No part of the Measuray touches the work.*

Whether it be hot or cold metal strip, or non-metallic materials, the Measuray provides amplification and sensitivity to check thickness to accuracies beyond any known industrial requirements.

The Measuray may be traversed across the moving sheet to obtain a check at any point, or an average check. It can be adapted to actuate an indicator, signal lights, or a recorder, singly or simultaneously.

A combination of X-Ray and electronics is used as the gaging principle to measure the mass—therefore temperature, weaving of the stock, speed of motion, and proximity of the gaging head to the work are relatively unimportant factors. The Measuray conforms to the safety standards of American Standards Association and National Bureau of Standards.

Write for complete information. Better yet, bring samples to Sheffield in Dayton and check them on the Measuray.

For an early installation (orders exceed production) see the Measuray in action and arrange for a Sheffield factory representative to visit your plant and draw up plans for your application.

Standard gages and measuring instruments shipped within 24 hours.

SHEFFIELD MASTER CRAFTSMEN

Real job security is provided only by plentiful incoming orders shipped at prices consumers can afford and want to pay . . . modern machines help make this possible.

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

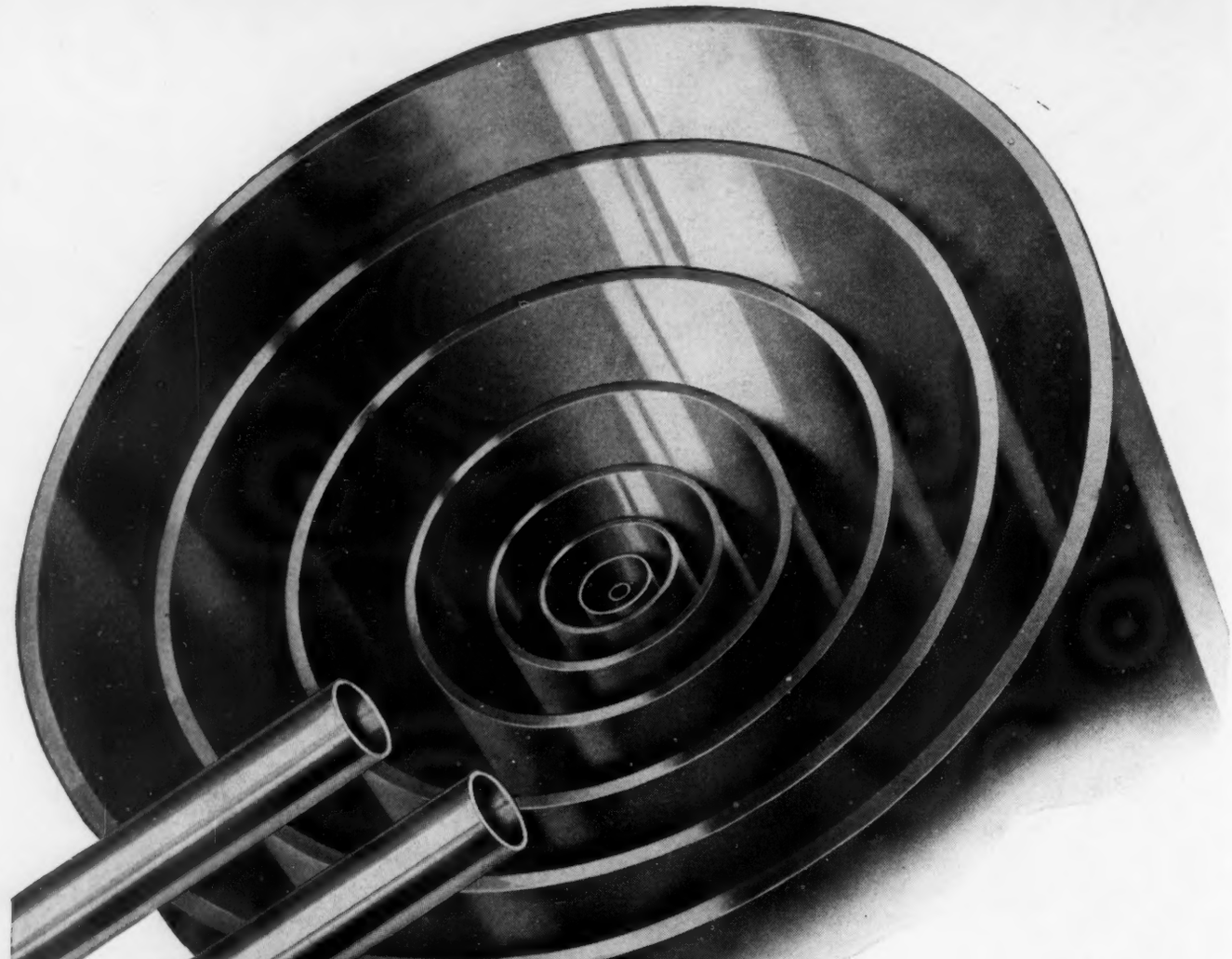
MACHINE TOOLS · GAGES · MEASURING INSTRUMENTS · CONTRACT SERVICES 2327

1946 was an outstanding year in Coke Oven Plant activity

The by-product coke industry's reconversion program has included a large number of contracts for rehabilitating old coke-plant facilities and for expanding existing plants.

Improvements incorporated in the new ovens include "saddle-brick" wall construction, self-sealing doors, waste gas recirculation with underjet design and wider acceptance of double collecting mains.

In addition to the coke oven construction, current work includes modernization of by-product and benzol recovery equipment, and a novel development in hydrogen sulfide recovery from coke-oven gas for the production of sulfuric acid. A plant of the latter type is now under construction. Koppers Company, Inc., Koppers Building, Pittsburgh 19, Pa.



GLOBE STEEL TUBES

what's your need in SIZE?

Globe seamless steel tubing is made hot finished and cold drawn in alloy and carbon steels in sizes from ½ inch to 6⅝ inches outside diameter.

Globe seamless stainless steel tubing is available in tube sizes from ½ inch to 6⅝ inches outside diameter and in pipe sizes ⅛ inch to 6 inches, standard, extra strong and double extra strong weights.

Gloweld (electric welded) stainless steel tubing may be had in sizes ranging from ⅜ inch to 4 inches outside diameter inclusive, and in standard weight pipe sizes ⅛ inch to 2 inches, inclusive.

Your tubing needs may lie somewhere within the above ranges — whatever your requirements, Globe is qualified by experience and facilities to supply you with tubing of the quality and uniformity you demand.

GLOBE STEEL TUBES COMPANY, Milwaukee 4, Wisconsin

GLOBE TUBES

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★ CONDENSER AND HEAT EXCHANGER TUBES ★ MECHANICAL TUBING

5025

cess. With proper control and operating technique, the scarfed slab surface will give a rolled product equal to or better than that obtained by other methods."

Use of Oxygen in Open-Hearth Furnaces Holds Promise

L. I. Dana, research manager, Linde Air Products Co., New York: "Postwar pressure for increased steel production at lower cost undoubtedly was the spark that touched off present extensive activity in investigating the effectiveness of using oxygen in open-hearth furnaces to speed up the time of heats. Oxygen has been injected into the end burners at a number of furnaces, supplementing that coming with the air from the checkers. Faster melting of scap and cold metal results from the increased flame temperatures and greater heat quantity developed per volume of combustion space. Thus meltdown time has been reduced from 10 to 25 per cent, the exact amount depending on many conditions.

"As yet, the experience with oxygen firing has been limited, the maximum number of heats in any one furnace being about 50. Periods of operation have been altogether too short to determine definitely the effect on the life of the roof and other refractories, although, no serious impairment has been evident so far. Scrap charging rate must be increased to keep pace with speedier melting. Movement of scrap from storage to charging becomes the bottleneck, so that extensive modifications in the mill are indicated.

"Oxygen also has been injected directly into the open-hearth bath to reduce refining time. Faster rates of carbon removal than normally encountered have been attained. As much as two to three hours in refining time sometimes have been saved. Steel pipe lances now used for injection burn up rapidly and are burdensome to handle, thus improved methods of injection must be developed. Metallurgical consequences of this oxygen treatment are still indefinite.

"The year 1947 probably will see increased activity in experimenting with both phases of the use of oxygen in the open-hearth. Rather than a few spot heats, many campaigns will have to be completed before the economics of oxygen use can be finally judged. Improvements are required in burner application and bath injection methods. Even if it were practical and economical, immediate increase in steel output is unlikely, because of the many problems in eliminating mill bottlennecks. Ultimately, for the use of oxygen in the open-hearth to become general, its effect in reducing costs of steel production must be demonstrated."

New Type Continuous Mill To Produce Seamless Tubing

John Young, vice president, National Tube Co., Pittsburgh: "Over the past several years, National Tube has developed the stretch reducing process, for the continuous production of small diameter hot-rolled seamless pipe and tubing. The pipe is stretched at the same time it is being reduced in the sizing rolls by increasing the relative speeds of the rolls in successive stands to a greater degree than is required to compensate for the change in section area produced by the reduction in the several roll passes. Application of this principle not only permits a substantial reduction in wall thickness of the tube to be made in the sizing mill, but also provides a means for making exceptionally large reductions in the diameter of the tube with a relatively small number of roll stands. Further advantages of the process are the greater speed of rolling and the longer lengths produced. Two stretch reducing mills are now under construction, one at Lorain, O. and the other at Gary, Ind.

"The first all-welded bessemer steel plant in the world is under construction at Lorain. Converters, mixers, and all hot metal handling equipment are welded throughout. Another feature of this plant is that the hot metal transfer system between mixers and converters is completely automatic.

"Among new developments in steel pipe plant layout is the extension of material handling and conveying facilities, particularly the underground conveyance of pipe from the hot finishing end to the finishing departments to eliminate the use of overhead cranes.

"The largest pipe warehouse in the world is also under construction at Lorain. This warehouse is unique in many ways. It is 1326 x 125 ft and will have storage space for 40,000 tons of various sizes of pipe and tubes. The building is radiant heated, artificially lighted, and will provide for standard railroad cars to move lengthwise through the warehouse for progressive loading."

Carbon-Graphite Material Being Considered in Product Design

Fremont F. Ruhl, Graphitar engineer, United States Graphite Co., Saginaw, Mich.: "Consideration now being given to Graphitar, a carbon-graphite composition, by industry establishes this product as a proved material. Design engineers over a period of years have recognized carbon-graphite because of its unique characteristics, and its ability to overcome difficult problems.

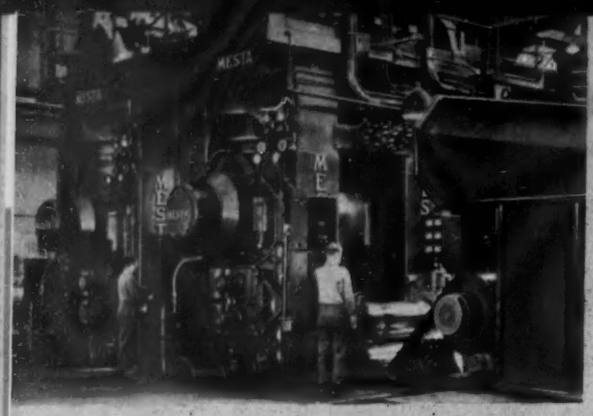
"The United States Graphite Co. now can produce various grades of this material that have a controlled porous or nonporous structure. Compressive strengths as high as 40,000 psi make available a stable, chemical resistant stock that will: Seal all varieties of petroleum and chemical fluids at high speeds, pressures and temperatures; operate as a self-lubricated bearing in the chemical, steel and food industries; act as the full operating section of an oxygen, hydrogen or chemical gas compressor under high pressures; allow production of an oil-free, dry air compressor; provide hard, light, stable material for vanes in pumping units; and maintain strength at very high, nonoxidizing temperatures.

"These and many added features of this carbon-graphite material which are being continually augmented by production techniques and research, enable this product to keep abreast of industrial demand, and even prepare it for intelligent consideration in product design."

Beneficiated Raw Materials Mark Beginning of New Era

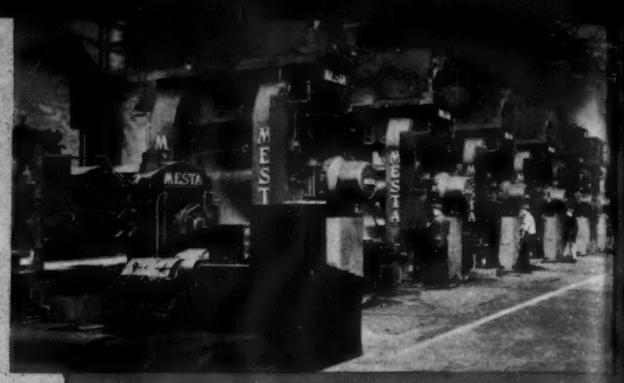
Charles E. Agnew, consultant, blast furnace and sintering plant operations, 17628 Winslow road, Shaker Heights, O

"Raw materials in adequate quantity and quality constitute the foundation upon which any industry is built. For close to



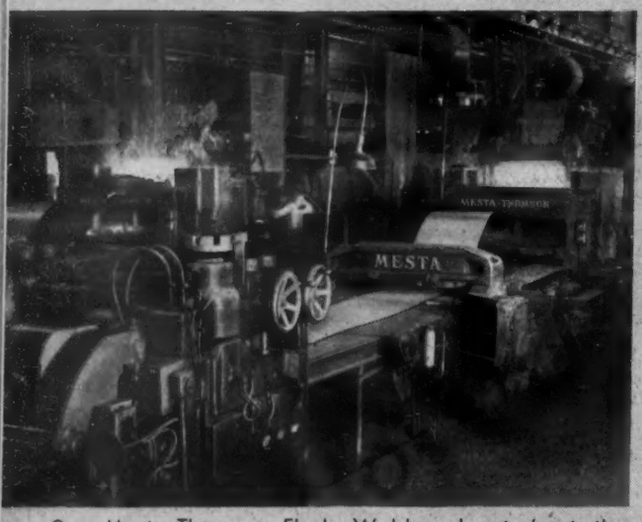
All required tempers can be produced on this Mesta 48" High Speed, Twin Four-High Cold Skin Pass Mill

Mesta 56" Four-High Continuous Hot Sheet Strip Mill

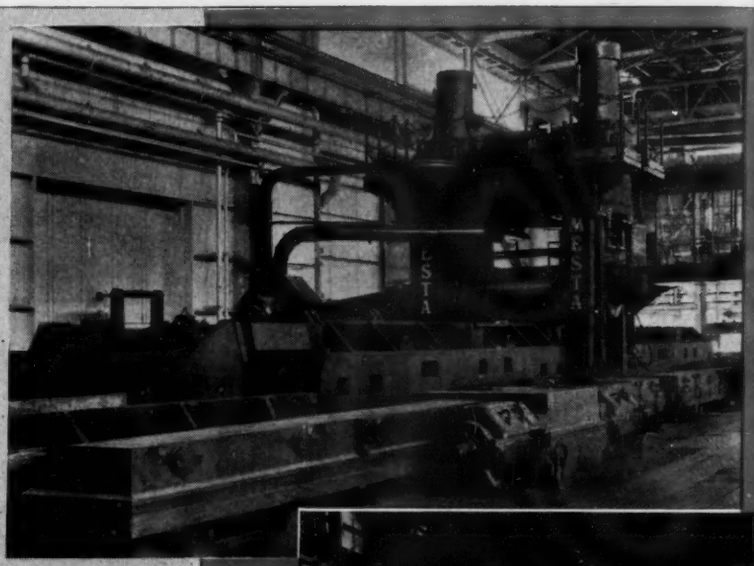


MESTA

WORLD'S LEADING DESIGNERS

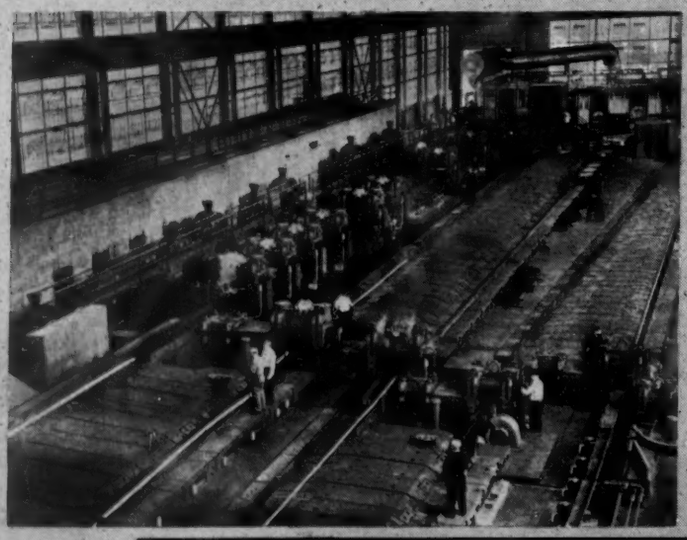


Mesta-Thomson Flash Welders located at the entry end of two Mesta Continuous Pickling Lines



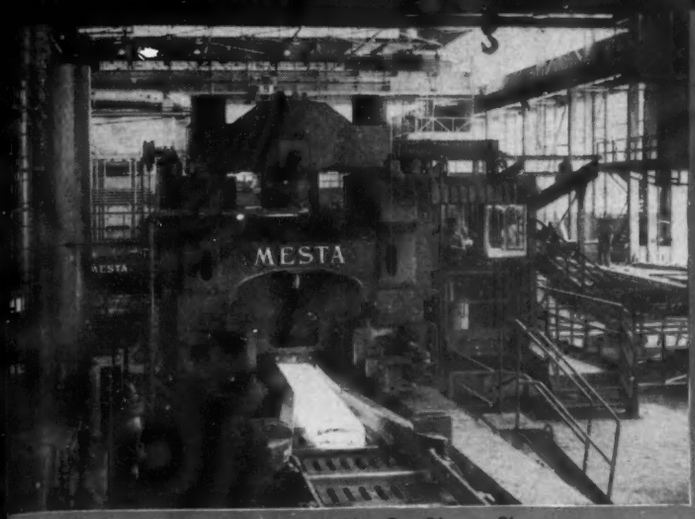
Mesta 46" Reversing Slabbing-Blooming Mill, Tables and Manipulators

Mesta 18"-14"-10" Merchant Mills and Transfers



Mesta 160" Four-High Reversing Pl... Mill, Side Guards and Entering Ta...

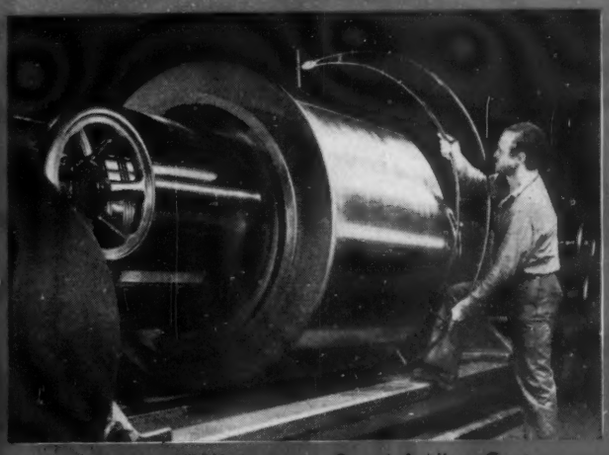
MESTA MACHINE COMPANY



Mesta Hydraulic Up-Cut Bloom Shear

Mesta Two-High and Three-High 29" Structural Mills and Traveling Tilting Table

S and BUILDERS of COMPLETE STEEL PLANTS



Mesta 56" diameter Special Alloy Cast Steel Backing-Up Roll for a modern high speed four-high cold reduction mill

Battery of five 42" Mesta High Speed Electrolytic Cleaning Lines

Mesta 54" Four-High, Four Stand Tandem Mill for the cold reduction of thin sheet strip and galvanizing stock

18,000 Ton Hydraulic Die-Forging Press for magnesium and light alloys. This unit, designed, built and installed complete by Mesta, is the world's largest four-column press

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100 years the iron and steel industry of the United States has been favored by having an abundance of excellent raw materials existing in the natural state as the major source of supply. During that period the industry has attained a position of world leadership.

"Approaching exhaustion of naturally rich iron ore deposits of the lake region and better grades of coking coal, marks the end of an era in blast furnace operating economy based upon the use of such materials and the beginning of a new era based upon the use of beneficiated raw materials as the major source of supply.

"Blast furnace operation is governed by basic principles which do not change but the practice methods which can be successfully employed in the application of those principles do change with alterations in the character of the raw materials used. Acceptance of this simple fact appears to be the first requisite for proper understanding of the use of beneficiated raw materials and of the changes in operating economy caused by such use.

"Inevitably beneficiation of raw materials will increase the capital investment required to produce a ton of iron but such increases have been characteristic with the development of the industry and as in the past the increase can be justified by improvement in the blast furnace operating economy."

Open-Hearth Operators Study Use of Oxygenated Air

L. F. Reinartz, manager, Middletown Division, American Rolling Mill Co., Middletown, O.: "Managements of steel plants in 1946 continued to drive for high production of ingots, despite labor disturbances and strikes, and serious shortages of transportation facilities, as well as insufficient coke, pig iron, scrap iron, and many supplies needed in steel production.

"The industry has been studying how to charge open-hearth furnaces more quickly and efficiently. Efforts are being made to increase the size of charging pans, to improve the physical condition and size of the scrap iron charge, and to enlarge open-hearth furnace door openings by changes in door frame design.

"A few more installations of basic brick ends in open hearth have been completed. Earlier installations are giving good account of themselves. Furnace downtime and cost of repairs are decreasing. Use of basic brick in roofs is still in an experimental stage. Suspension and spawling problems must still be solved.

"Management of every ingot producing steel plant is watching with close attention the experiments in the manufacture and use of oxygen in open-hearth furnace operations.

"Oxygen probably will bring results but furnace roof construction will have to be modified and improved. Undoubtedly, basic brick ends will become standard construction at that time. Technique of charging furnaces must be improved and speeded up; otherwise, the gain from more speedy melting will be lost. Burner design must be changed to meet the new conditions, and promote rapid mixing of oxygen and fuel. Organizations must be trained to handle higher flame temperatures, and how to take advantage of faster melting practice.

"Oxygen use in reducing carbon in the molten metal bath is practical but care must be taken to keep refractory bottoms in good condition, free of steel, or "burn through" may occur. Oxygen use, under control in carbon reduction, can speed up this phase of the refining by more than 50 per cent, and eliminate the danger of "undigested ore" in metal when tapped from the furnace. Quality of steel should thereby be improved.

"A unique method for reducing sulphur in "hot metal" for use in open hearths has promise for making low sulphur iron available at a reasonable cost for the manufacture of open-hearth ingots for cold strip and other quality products.

"Labor-saving devices, such as brick conveyors, vacuum suction systems, etc., are being used more and more because of bricklayer and labor shortages. One collateral advantage of basic ends in an open-hearth furnace is the friability of the deposits in the slag pockets which can be shoveled out easily, thus saving downtime and expensive sidewall repairs in the slag pockets.

"Not much publicity has recently been given to developments in improving steel quality through slag control, but real constructive progress is being made along these lines in a number of steel plants.

"In the coming months the greatest stress will continue to be placed on fast charging of furnaces, quick furnace repairs, more use of labor-saving devices, better training of operators, and on the quality melting and refining of steel, rather than depending on some panacea to cure all the ills of the steelmaker."

Additional Open Hearths To Be Equipped with All-Basic Ends

R. P. Heuer, vice president, General Refractories Co., Philadelphia: "One of the most important developments in refractories practice during 1946 was the increasing interest of steelmakers in the use of all-basic ends on open-hearth furnaces. Two different plants have demonstrated the economy of this practice showing savings in materials costs, labor costs and overhead charges up to $0.25 per ton. Numerous operators have made plans for the installation of similar all-basic ends on one or more of their open-hearth furnaces. There are now six of these installations in service and it is predicted that more than 12 additional installations will be made in 1947.

"Proven economy of all-basic ends has been demonstrated by different installations which have paid off their first cost, about $30,000 to $40,000 more per furnace than silica constructions, in a period of from one and one-half to two and one-half years. An equal saving can be expected during each period.

"Described savings have been achieved mainly in three ways enumerated below:

1. Long life of the basic refractories and small amount of brick installed in a basic-ended furnace result in a saving in refractories material cost. One furnace has now operated for more than 1500 heats with an average consumption of only about 3 lb of basic end refractories per ton of steel produced as compared with a normal consumption of 15 lb of silica end refractories per ton of steel.

2. Infrequency and small extent of required repairs, decreased amount of brick installed originally, and ease of slag removal from furnace slag pockets combine to bring about a decided saving in labor. Figures at one plant indicate that less than one third as many man-hours are required for maintaining a basic-ended furnace as are used in maintaining a comparable silica construction.

3. Decrease in required repair work also yields more operating hours for the furnace and a resultant increase in production. This increase amounts to as much as 4 per cent per year on one furnace and over 10,000 tons on another. This production increase spreads overhead charges with a decided saving per ton.

"Experimental work has been continued on all-basic open-hearth furnaces in which silica brick were supplanted by basic brick not only in the ends but also in the main roof. While no installations have made cost figures as low as comparable silica roofs as yet, one installation placed in service during October 1946 shows promise of doing so."

538 INGOTS CAST IN ONE GRAPHITE MOLD!

Using a single "National" graphite mold, a steel company has smashed all records by casting a total of 538 steel ingots. This was accomplished without any process changes, without the use of mold wash, and without treatment of any sort.

In addition to cutting mold costs 77.4%, graphite provided these benefits: Elimination of stickers...better surface condition—less cold lapping . . . improved grain structure. Many other advantages in pouring and stripping were obtained.

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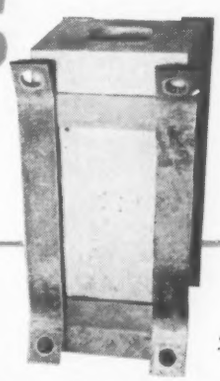

The graphite mold in which 538 ingots were cast

ADVANTAGES OF GRAPHITE FOR MOLDS:

Will not deform—at any temperature.
No stickers—stripping 30% faster.
Not wet by molten metals.
Heat conductivity 2-3 times that of cast iron.
More uniform cooling.
No mold wash needed—fewer inclusions.

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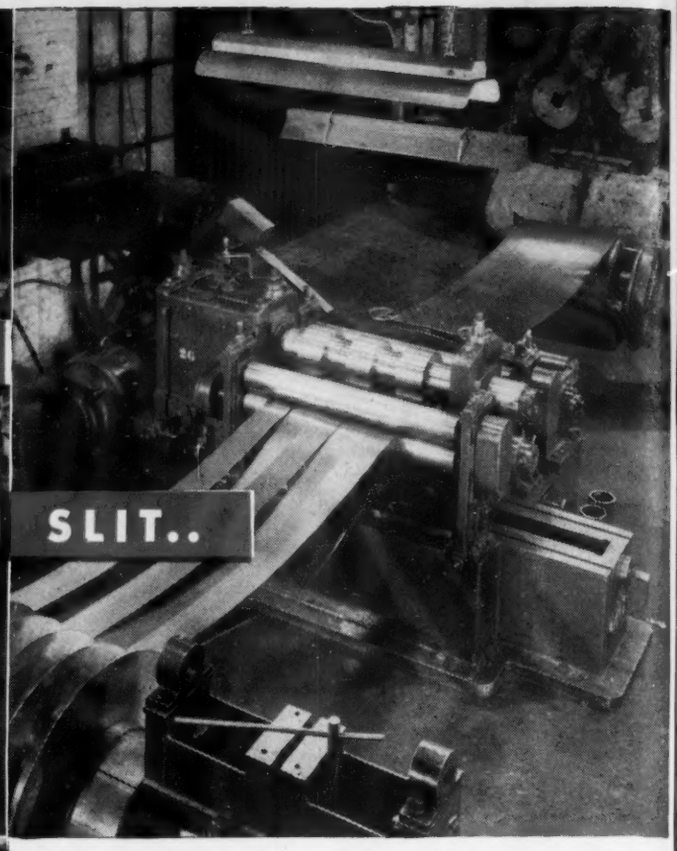

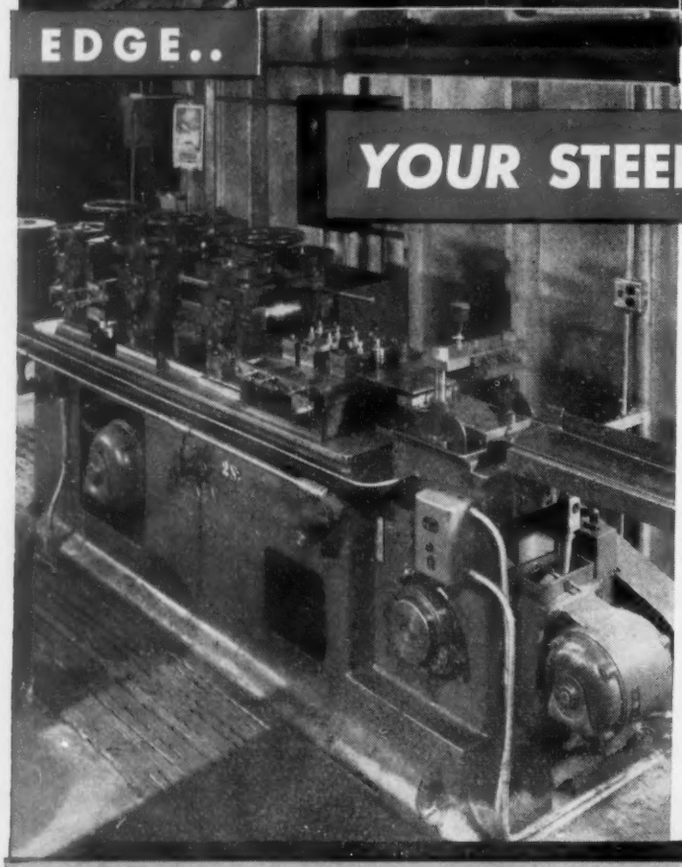

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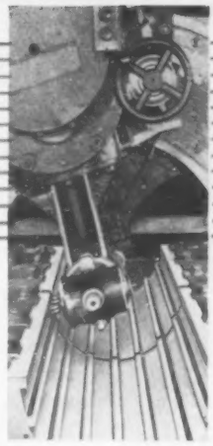


Modern tools can insure greater productivity per operator . . . Carbides encourage new techniques . . . Flexibility of broaching "spells" economy . . . Diversification follows plant expansion

Hole Finishing with Internal Grinder Begins a New Era

J. B. Johnson, vice president and general manager, Bryant Chucking Grinder Co., Springfield, Vt.: "Internal grinding not only has a future but is standing on the threshold of an entirely new era of great promise.

"Until recently, grinding of holes was a roughing operation on a precision job. Experience has shown that a free cutting wheel will produce a finish of under one microinch, and with the new internal grinders, holes can be finished round, straight, and to diameter tolerances of a few millionths of an inch.

"The finishing of small holes has always been a problem mainly because of wheel speeds. In order to cut properly, the grinding wheel must pass the metal at about 5000 fpm. With a grinding wheel of ⅛-in. diameter, speeds of 100,000 rpm are required. The highest practical speed for a belt driven spindle is 40,000 rpm. Engineers have perfected a high-frequency motor that drives the wheel direct at speeds up to 100,000 rpm and will grind holes to the above

"With these machines and equipment available, and they are available now, internal grinding will replace other methods of hole finishing where tolerances in 'parts of tenths' are needed."

New Production Methods Seen Through Use of Carbide Tooling

C. R. Harmon, manager of sales, Penn Carbide & Alloy Casting Co., Cannonsburg, Pa.: "The constant effort to decrease manufacturing costs and increase product quality and sales appeal has created a demand for a superior die material capable of producing more parts, cheaper, faster, and with improved accuracy and better finish. Industry did not have to look far. Experience gained through high speed war tooling left management with a high regard for carbide metal and a wealth of knowledge in its use and performance.

"It was natural, therefore, to turn to carbide for increased production in blanking, forming, drawing and extrusion applications. Carbide has proved to be more than equal to the assignment, and as in the case of cutting tools, operating speeds are now in many cases limited by the press rather than the dies. The inevitable result of such progress in dies will be more rigid and considerably faster presses designed specifically for carbide metal. Carbide dies, particularly in the blanking field, offer unlimited opportunities for engineering triumph since one of the most important factors in their successful operation is design. With the relaxation of price regulations, manufacturers will be more eager than before to attain volume production at minimum cost, and the answer in most cases is properly designed carbide inserted dies.

"The economy of mass production resulting in lower prices and better products available to a larger number of people is served by carbide equally well in household and industrial fields. Razor blades, zippers, and venetian blind parts are just a few of the everyday items being successfully blanked, coined, and formed more economically with carbide dies."

Tool Builders Have Much To Offer Industry in Cutting Costs

Frederick V. Geier, president, Cincinnati Milling Machine Co., Cincinnati, O.: "Out of the uncertainties of the past year, there should emerge in 1947 the new outlines of the peacetime industrial economy to come. Problems resulting from the war are superimposed on the old unsolved problems of the nineteen thirties.

"At the core of these problems is the necessity for high-level production at low unit costs. In the face of more expensive materials and high wage rates, this problem in practical economics was never more difficult to solve. But it will be solved by practical-minded engineers and production men, through drastic redesign of consumer products and retooling, to utilize the many cost-saving advances in machining and work-handling available today.

"There never was a time when the machine tool industry had so much to offer to help manufacturers cut costs. In rapid and efficient metal cutting, in work handling, in size control and fine finish, in automatic and tracer form-controlled operations, in new machines for operations formerly improvised—real advances are taking place.

"Industry, through production, will succeed in largely restoring for the people what the war and political opportunism have so seriously impaired. And in this, new production methods and machine tools will have an important part."

Machine Tool Trend Toward High Productive Efficiency

E. P. Blanchard, sales manager, The Bullard Co., Bridgeport, Conn.: "One of the most encouraging trends in the machine tool market has been compounded of two things: (1) The continuing demonstrated ability of the industry to create new machines of unprecedented productive efficiency, and (2) the realization by industry in general that the productivity of these new machines is all-important in maintaining a workable and realistic relationship between prices and wages in the overall economic structure.

"We regard our own contributions toward maintaining this relationship as significant and typical. A new spacing device for drilling, boring, reaming and tapping without jigs produces time sav-

ings alone of 20 per cent and upwards. A control device that has been made an integral part of our vertical turret lathes, is establishing in some instances almost incredible records. The vertical turret lathes themselves have been made with sufficient ruggedness to take the heavy cuts of metal required by mass production methods without loss of accuracy.

"All these factors stand as proof that the machine tool industry is living up to its promises of postwar greatness. Conclusive proof lies in the marked preference customers are showing for the new, improved machine tools over the older models, especially in matters where costs are of critical importance."

New Developments in Gearing, Feeding and Power for Lathes

B. N. Brockman, vice president and sales manager, R. K. LeBlond Machine Tool Co., Cincinnati, O.: "In 1947 we expect to see more technical progress in lathe design than during any other period. In our own plant we have been developing higher spindle speeds for use with carbide tools, but we have held our speeds within sensible limits and have made no compromise with power.

"This company's dual drive lathe which was recently announced is in keeping with this policy. Its top speed of 1800 rpm is relatively high, and there's plenty of power in its two independent speed ranges for substantial stock removal.

"New types of motive power, and many new developments in gear shifting, driving, and feed mechanisms are likely to be announced by lathe manufacturers during the coming year. Some of these are devices perfected during the war and are now being applied to machine tools on an experimental basis. Should they prove successful, they will undoubtedly be introduced during 1947.

"It is worthy of note that many of the improvements now being perfected take into account the subjects of convenience and comfort of the operators, fully as much as those involving increased speed.

"More attention will undoubtedly be devoted this year to the field of special purpose machines. New production techniques, as well as the need for increased productive output, will call for metal working beyond the scope of the standard lathe.

"Less spectacular, but nevertheless just as important, is the improvement of the standard lathe. This is a continuing program with our company, and we are constantly in touch with changing requirements of the metalworking industry."

Special Qualities of Carbides Fit Them for Boring Operations

James R. Longwell, director, engineering and research, Carboloy Co. Inc., Detroit: "There are times when it doesn't pay to be good at something. The danger always exists—in this industrial era of specialization—that the man or the material, whichever it may be, becomes 'typed.' That, until recently, is what had happened to the cemented carbides.

"The vast importance these metals attained in the fields of cutting tools and wire and tube drawing dies, tended to obscure the fact that hard-metal carbides fundamentally are not just 'tool' or 'die' materials but are actually a completely new series of metals, having a large number of unusual properties and almost unlimited possible combinations of properties.

"Practically everyone in industry knows that cemented carbides are hard, harder than the hardest steel, and that they maintain this hardness at red heat. That's what gave them their successes in the cutting tool field. So well did this characteristic become known, as a matter of fact, that other valuable characteristics were ignored.

"Today, however, we are finding ourselves in the position where carbides are being applied to uses where hardness plays only a minor part, if any. An example in point is the growing use of cemented carbides for boring bars. Here the interest is based primarily on the fact that these metals have a high modulus of elasticity.

"This means that there is less deflection torsionally or transversely. This means that deep holes can be bored to tolerances not possible heretofore. (Example: Boring valve guides, 8 diameters long within a tolerance of 0.0002-in. for straightness and roundness, in one operation).

"What other fields of potential use there may be for carbides based on this one factor alone—high modulus of elasticity—is difficult to estimate. So far, we know, the field has barely been scratched. And beyond that are such attributes as resistance to erosion and many forms of corrosion, the high compressive strength and toughness, and many other physical characteristics which offer opportunities for improved designs of products and lower manufacturing costs to industry. Undoubtedly, 1947 will see a major expansion in the variety of uses, from these standpoints, of hard metal carbides."

Disposition of Cutter Blades Accorded More Attention

R. R. Weddell, president, Weddell Tools Inc., Rochester, N. Y.: "Current machine shop practice is primarily concerned with the use of carbide cutters. Today our problems are again with the machining of cast iron.

"We find that we are revising our tooling ideas that were led astray with the carbide machining of steel or aluminum. Instead of the widely spaced cutters, those with more teeth seem to handle the comparatively frail castings to better advantage. Carbide, of course, dominates the field for this material. The lesser power and cutting speeds required for cast iron necessitate the use of closely spaced cutters to obtain greatest efficiency.

"To obtain best tool performance and economy, more thought is being given to the disposition of cutter blades for cutting action and maintenance. A cutter wears in the direction of its feed. Study of the dulled edge of a lathe tool, a drill, a reamer or a milling cutter will show where they dull principally.

"Most grinding is required on the edge that feeds into the cut. Therefore, cutter blades should be mostly adjustable in this direction. Otherwise, the useless grinding, particularly of the hard and comparatively expensive carbide, is mostly wasteful.

"Grinding of carbide tools demands a precise and exacting technique. The increased performance obtained with properly ground carbide tools is astounding. Carbide tools must be smoothly and accurately ground. All industry must bear down on this problem.

"The makers of carbide cutting tools, grinding equipment, and material are anxious to extend their experience to the user. It behooves shop management to see that its staff, from the top to the lower ranks, obtains and practices this

knowledge. There is no other single item in machine shop practice that will reap greater dividends of increased productivity than the intelligent grinding of carbide tools."

Modern Equipment Can Insure Higher Individual Productivity

H. H. Pease, president, National Machine Tool Builders' Association, and president, New Britain Machine Co., New Britain, Conn.: "Machine tool builders are meeting the competition of the wartime machines in government surplus by improving their machines. The metalworking industries of the nation realize more keenly than they did before the war how much more effective a working organization can be if it is properly equipped. They had to tool up for entirely new products during the war years, and were able to disregard the first cost of the equipment they needed, since cost was secondary and production a matter of extreme importance. As the plant came into production, they watched their costs go steadily down, and the volume they secured, although they had to work to very close limits of accuracy, surprised everyone.

"As a consequence of that experience, all of our shop men realize that the first cost of the equipment is not as important as getting the right equipment. And while most of us associate savings in production costs with mass production, it is in those plants where volume is limited that the interchangeability of parts that can be secured by means of accurate, modern machine tools is of particular importance.

"The recent experience of the nation in the field of wages and prices has brought home to all of us a much better understanding of the role of production equipment in the economic structure of the nation. Real wages can be increased only as output per man-hour is increased. Temporary gains can be made by one group or another at the expense of the other workers, but in the end the relation of wages and prices must come into balance or there is no gain to anyone.

"Better equipment, and the determination on the part of worker and management alike to get the utmost out of that equipment, is the key to wider employment and better living for us all. We know that wage rates are lower in other countries with whom we must compete in world markets. The only way to compensate for that difference is to secure more production per man. It can be done if the need is clearly seen and understood. The machine tool builder regards this as a challenge to his skill, and is determined that this nation shall not surrender its leadership in his field."

Productivity of New Machines Aids in Price-Wage Balancing

H. E. Conrad, executive secretary, American Society of Tool Engineers: "The motto of the American Society of Tool Engineers is: 'Behind every product that is mass produced is the tool engineer.' This is the claim that mass production and its widespread benefits are the result of machines, tools, and their best application by tool engineers.

"The benefits of mass production are evident in the rising standard of living in America for the average man. More and better consumer goods for more people came about through using machines to achieve a better quality and variety of merchandise. At the same time, this provided the employment and wages to enable people to enjoy the fruits of their labor.

"One hundred years ago the average weekly wage of American workers was $5, while the investment in machinery averaged less than $500 per worker. Today machinery and plant investments total an average of approximately $7000 per worker. The result is as Carl Snyder in his book, 'Capitalism the Creator,' points out. In the 90 years from 1849 to 1939, investment in tools per worker increased in this country 812 per cent while labor's real wages were multiplied four times in terms of the goods and services it could buy; further, this reduced labor's work week from an average of 59 to 39 hours.

"Tool engineering is the hub of our whole modern production, for in this sphere of activity is determined how a product can be produced accurately and efficiently, at a cost that will make it saleable to the public in sufficient quantities to make its manufacture practical and attractive to management. The inventor can conceive a new product. The design engineer can make it workable or give it sales appeal. But it remains for the tool engineer to devise its mass production so that the price makes it available to the millions to enjoy instead of only a favored few.

"Whether the product is considered a luxury or has become a necessity through habitual use and availability is determined by tool engineering. Automobile tires once cost $50; today a tire with a tenfold use span costs less than half this amount. Electric light bulb cost 60 cents apiece only a few years ago. Today an improved light bulb costs only ten cents. Already an airplane manufacturer has been able to reduce the selling price of a personal plane from $15,000 to $3900 through tooling and mass production simplification in desgn.

"Paced by the use of machinery and tooling, all industries can yield or continue to yield an ever-increasing benefit to every American."

Jig Borer and Jig Grinder Team Up Effectively on Tougher Jobs

R. F. Moore, president, Moore Special Tool Co., Bridgeport, Conn.: "Nearly everyone is now familiar with the 'partners in production,' our jig borer and jig grinder and the ability of these machines to locate and make holes in soft and hardened steel.

"However, not so many people are familiar with the stunts we are able to do with this combination, particularly the jig grinder. Many users of the jig grinder have found it practical to grind internal contours (radii, flat surfaces, etc.) on high carbon, high chromium dies for laminations; in fact, any internal shape except a sharp corner.

"We can put holes accurately in a blank piece of Carboloy by first cutting it through in the jig borer with a tube of soft metal and diamond powder, similar to the old stunt of putting holes through glass. After the hole is put in the Carboloy to approximate location with the aid of the jig borer, the holes can be sized and located exactly in the jig grinder.

"Another stunt possible, not too commonly known, is to put holes through high carbon, high chromium steel or any kind of *hardened* steel with a tap disintegrator. Once the hole is worked through the piece, the jig grinder will

size and locate it. This is valuable in three places: (1) Where holes are forgotten or missed, (2) where engineering changes require added holes, and (3) in the Dutchman, which is difficult to locate before hardening and assembling the part to be doweled."

Indexing Trunnion Stand for Jig Increases Radial Drill's Value

Alfred Kullman, vice president and works manager, American Tool Works Co., Cincinnati, O.; "The development and use of the indexing trunnion stand for supporting and indexing box type jigs has materially increased the versatility and productivity of the radial drill.

"It makes possible the use of the radial drill for accurate boring, counterboring and spot facing operations which previously were largely confined to the horizontal boring mill. Not only does this technique produce highly accurate and finely finished surfaces, but in the great majority of cases, reduces the machining and handling time over that of other methods.

"This technique is being used extensively and with utmost satisfaction in our own plant and has shown actual time reductions of 50 to 75 per cent from methods previously employed.

"These indexing trunnion stands are made in standard sizes to accommodate a variety of jig sizes and arranged for mounting on the standard radial drill base. An indexing means is provided for indexing the jig which is mounted on the trunnion each 90 degrees. If other indexing increments are required, a supplementary indexing means is provided. When large jigs and heavy work are involved, an outboard support is provided for added stability.

"This method is so simple and foolproof that an inexperienced operator may quickly acquire the knowledge needed for this type of work. The radial drill, which acts as a driver, is simple and easy to operate and provides a wide range of speeds and feeds admirably suited to boring, drilling, facing and tapping operations both large and small. The intricate adjustments and close measurements required in horizontal boring, which only experienced operators are qualified to make, are noticeably lacking.

"The accuracy of the work produced is determined by the accuracy of the jig and tools that are used, not by the ability and experience of the operator. This fact alone is one of the strongest recommendations that can be made for this method of boring.

"There are also other advantages such as much better chip disposal where the work is done vertically and less manual effort in handling and locating heavy boring bars.

"It is my firm conviction that this comparatively new machining technique is destined to find wide acceptance by the metalworking industry as the industry members become more familiar with it and its many advantages."

Flexibility of Broaching One Reason for Economical Operation

Harry E. Gotberg, chief engineer, Colonial Broach Co., Detroit: "As industry enters what promises to be one of the most highly competitive years it has ever seen, broaching finds itself in the strange position of a 'new' process. Old as the art of broaching is—and modern broaching dates back to around 1918—it is encountering new demands in 1947.

"The reasons are simple. Broaching, internal or surface, is one of the fastest methods of metal removal yet developed. Machines need not be operated at higher and higher speeds in order to get 'production'. The broaching tool itself takes care of that. As a broach moves through a hole or over a surface, 'tool' follows 'tool' in rapid succession, each performing its share of the job of chip production. One stroke, and the job is finished.

"Further, broaching has reached the stage where the shapes generated by the broaching tools can be held to extremely close tolerances. Sometimes this makes possible the substitution for several other operations of a single broaching operation.

"That demand promises to increase rather than decrease as competition becomes keener and pent-up demands for consumer products 'at almost any price' are filled.

"In the meantime, much work has been done by broaching equipment producers in developing means and mechanisms for eliminating or reducing both manual handling of work or tools and loading and unloading time, thus further increasing the floor to floor productivity of the broaching process.

"Incidentally, the interest in broaching is not confined to the larger plants but extends into many of the smaller shops in which it was previously thought that broaching was too 'high production' to be economical. Flexibility of modern broaching equipment, enabling the same machine to be used on all kinds of miscellaneous jobs, has taught these shops that broaching is economical even where production is only on a job lot basis."

Many Unfilled Wants Call for Improved Techniques and Tools

Walter S. Praeg, president, National Broach & Machinery Co., Detroit: "In spite of the many current obstacles to industrial progress, I am optimistic as I look forward to the opportunities which I believe will be presented to organizations which have retained a supple mental attitude and which still have what the military strategists refer to as 'the will to fight,' which, incidentally, was so ably portrayed in the current film, 'Henry V.'

"Many wants yet unfulfilled call urgently for improved techniques and equipment, designed to produce more rapidly and more economically than that which up to this time was thought to be adequate. The organizations which supply and effectively promote such techniques and such equipment have nothing to fear in either the immediate or long-range future.

"I consider our company fortunate in this respect. Two new machine tools are just now ready for the market. Both specifically engineered to meet the current need for high production with a minimum amount of human supervision.

"One of these machines is a diagonal gear shaver, incorporating a wholly new concept in shaving practice—one which broadens the scope of gear shaving and materially reduces shaving time.

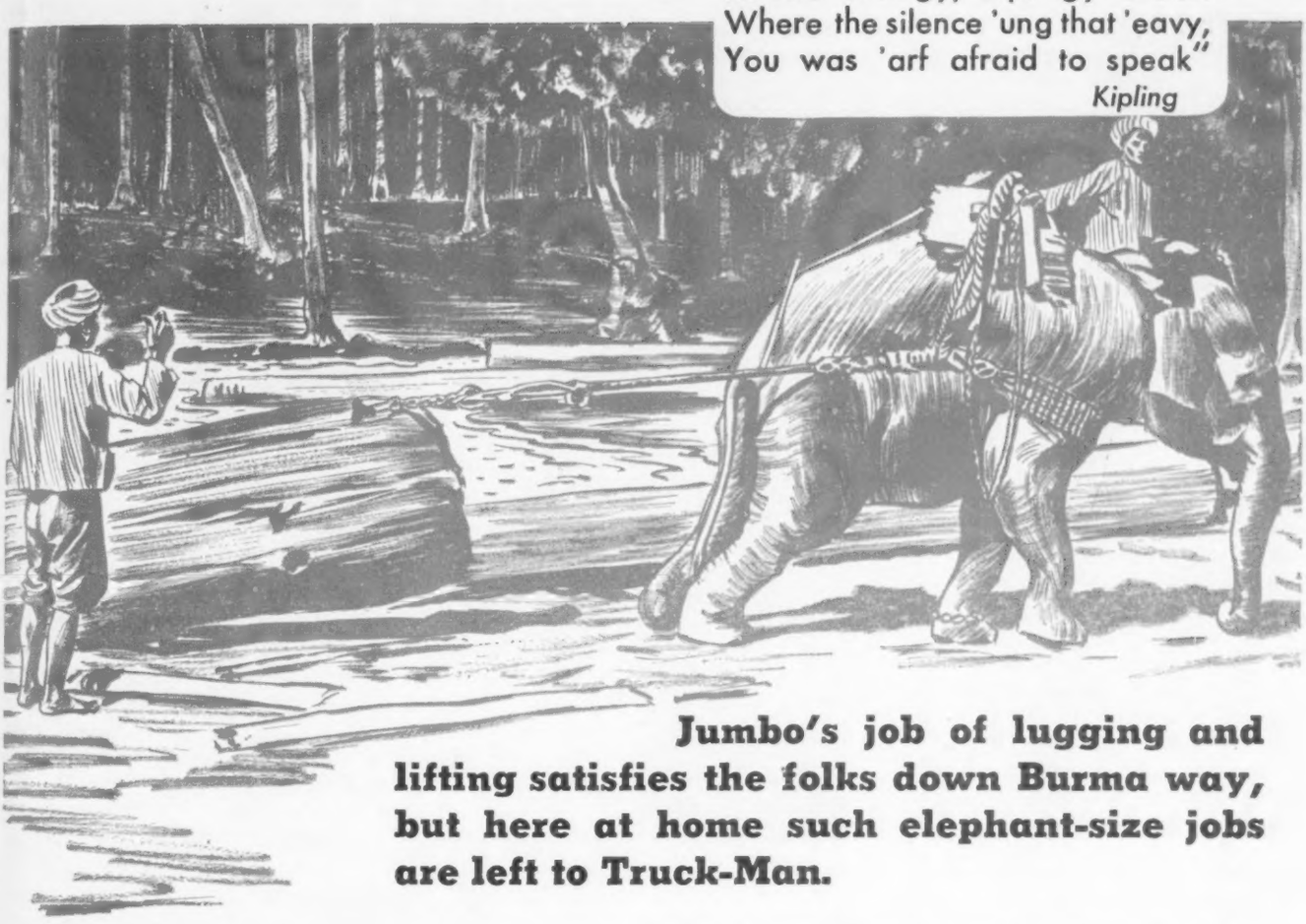
"The second machine is a new gear shaving machine, completely automatic except for the simple operation of loading and unloading, which provides continuous cutting at two stations simultaneously while the two remaining turret stations are being unloaded and loaded. This machine effectively eliminates human error on the part of the operator.

"A further development in the field of gear cutting has progressed to the point

ON THE ROAD TO MANDALAY

"ELEPHINTS A-PILIN' TEAK--

In the sludgy, squdgy creek
Where the silence 'ung that 'eavy,
You was 'arf afraid to speak"
Kipling



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that it will probably be announced in the coming year and it too will have a revolutionary influence on gear practice."

Doubled Capacity of Plant Inspires Diversification

Charles J. Stilwell, president, Warner & Swasey Co., Cleveland: "Warner & Swasey, with the end of the war, was faced, like many another concern in the machine tool industry, with the alternative of shrinking back to its prewar size or addressing itself aggressively to developing additional business with which to fill profitably not only its old but its war-expanded plant facilities.

"The company's present capacity is double that of prewar 1939 and its nearly 3000 employees are more than double the number who were on the payroll 7 years ago.

"The manufacture of machine tools has been and will continue to be this company's chief occupation. However, with the government disposal of surplus machine tools still to reach its peak, it was felt essential to broaden manufacturing activities to include other machinery products for the immediate future. Our sense of obligation to our shareholders, to our employees and to the community would not have it otherwise.

"Strictly machine tool developments have included a five-spindle automatic machine, a precision tapping machine, and an electro-cycle turret lathe on which shipments have already begun.

"Applying much the same kind of engineering design and production skills required in the manufacture of machine tools, our engineers have also developed a multi-purpose, hydraulically controlled earth moving machine of unusual versatility. The new machine, in addition to performing the usual excavating, trenching, and loading operations, can do precise contouring and straight-sided excavating, thereby eliminating the costly and tedious hand labor otherwise required. Deliveries of these new machines are already being made and several hundred more are scheduled for early delivery.

"In the textile field, we have begun the manufacture of a pin-drafting machine for use in the complicated process of making worsteds. We are also utilizing some of our facilities to build a textile knitting machine. While engineering and sales of this product are the responsibility of others, our employees had the skills required to build the new unit to the standards and in the quantities desired.

"Also, strictly as contractors, we are making some special machinery for the canning industry and have re-engineered and are manufacturing a collating machine to be used in the bindery of a major magazine publisher.

"Looking to the future, we believe the cost-cutting possibilities inherent in modern machine tools will produce an increasing demand for them from industries at present too bedevilled with labor and material problems to undertake further modernization for the moment. To that end, our engineers are continuing with the development of other new machine tools whose manufacture, we believe, will ultimately absorb our expanded plant facilities to the exclusion of present contract work."

Scope of Servo and Tracing Systems To Be Extended

Albert H. Dall, assistant director of research, Cincinnati Milling Machine Co., Cincinnati, O.: "The need for higher production machine tools is more pressing than ever because, with increasing hourly rates for labor, it is only possible to prevent corresponding price rises by increasing labor output per hour. During the last two decades many of the high production machine tools have employed hydraulic mechanisms to accomplish fast and accurate operations.

"It has long been recognized that smooth, powerful and accurate slide motions can be realized by the use of fluids under pressure. Developments prior to the war in the field of hydraulic pumps and motors made it possible to further expand the use of hydraulic transmissions. During the war, considerable progress was made in this direction by the application of hydraulics to tank turrets, gun control systems and aircraft.

"The well known advantages of automatic cycle controls by means of hydraulic valves will result in the continued expansion of hydraulic applications to high production machine tools. The use of sensitive servo and tracing systems, which found wide application during the war, will be extended further. The fields to which these systems can be applied has barely been scratched.

"The use of hydraulics may be extended when used in combination with electronics. Design difficulties, which have been the chief stumbling block in these systems, will be overcome by closer co-operation between the electronic engineer and the hydraulic engineer.

"Extensive research is being carried on by leading manufacturers of hydraulic and lubricating oils, with special attention to the development of new and improved hydraulic fluids."

Costs Rather Than Prices of Tools To Be Watched in 1947

S. B. Hellstrom, general manager, Detroit Tap & Tool Co., Detroit: "In 1947, more than ever before, *costs* rather than *prices* of cutting tools are going to be watched. And when industry talks about cutting tool costs it means not only the initial tool cost, but the overall costs per price produced. Such costs include: (1) Initial cost of tools; (2) pieces produced per grind; (3) frequency and length of machine shut-downs for grinds; and (4) cutting speed as an index of machine productivity.

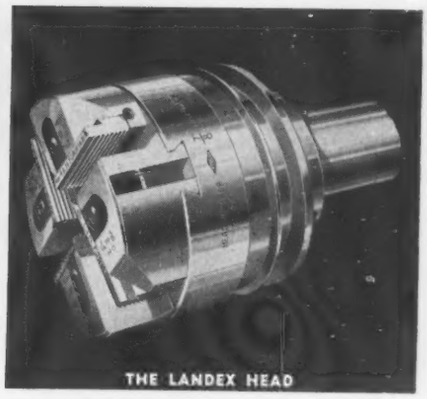
"The reason for the greater emphasis on the last three factors is evident from a consideration of trends in manufacturing methods. Today the emphasis is on productivity per machine-hour and man-hour. Machines are being designed to turn out more in a given time with less effort on the part of the operator. Wider use of semiautomatic and automatic work handling methods inevitably means that the machines themselves will pace production on the line.

"It is evident, however, that if any machine has to be shut down, regardless of the cause, it will interrupt the flow of production. That means a greater emphasis on cutting tools with the ability to 'take it' hour after hour. After all, machining is mainly the manufacture of 'chips,' and it is the tool which actually does that—manufacturing. The machine is the holding and operating device for such tools and work.

"In the thread production field this condition has been recognized and emphasis is being put on the production of taps, thread milling cutters, thread rolls, etc., which will produce more pieces faster with less tool wear. At Detroit Tap, for instance, this development has taken

THE LANDMATIC HEAD

LANDIS ALT COLLAPSIBLE TAP



THE LANDEX HEAD

The LANDIS LINE

THREAD CUTTING MACHINES
- Landmaco Threading Machines
- Bolt Factory Threaders
- Automatic Forming and Threading Machines
- 4 Spindle Semi-Automatic Threading Machines
- Pipe and Nipple Threading Machines

THREAD CUTTING DIE HEADS
- Landmatic (for Turret Lathes and Screw Machines)
- Landex (for Automatic Screw Machines)
- Lanco (for Automatic, Semi-Automatic and Hand-Operated Threading Machines)
- Lanco Pipe and Nipple Threading Heads
- Stationary Pipe Die Heads
- Reverse Taper Die Heads
- Standard Rotary Die Heads

PRECISION THREAD GRINDERS

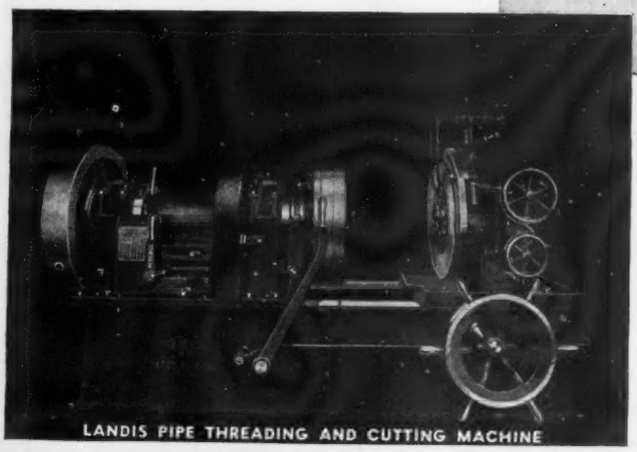
PIPE THREADING AND CUTTING MACHINES

ROLLER PIPE CUTTERS

CHASER GRINDERS

COLLAPSIBLE AND ADJUSTABLE TAPS

LANDIS CENTERLESS THREAD GRINDER



LANDIS PIPE THREADING AND CUTTING MACHINE

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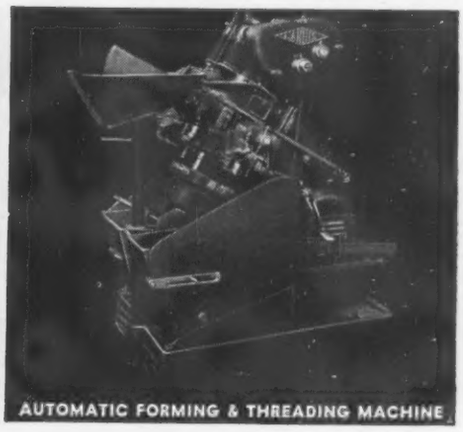
LANDMACO THREADING MACHINE

LANDIS ⅛" THREADING MACHINE



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America's Best Looking Cap Screw

Made of high carbon steel—AISI C-1038—to standards for full finished hexagon head cap screws. Heads completely machined top and bottom. Hexagon faces clean cut, smooth and true, mirror finish. Carried in stock.

"HI-CARBS"

Heat Treated Black Satin Finish

Made of high carbon steel—AISI C-1038. Furnished with black satin finish due to heat treatment. Hexagon heads die-made, not machined. Point machine turned; flat and chamfered. Tensile strength 130,000-160,000 p.s.i. Carried in stock.

FLAT HEAD CAP SCREWS

Heads completely machined top and bottom. Milled slots—less burrs. Flat and chamfered machine point. Carried in stock.

FILLISTER CAP SCREWS

Heads completely machined top and bottom. Milled slots—less burrs. Flat and chamfered machine point. Carried in stock.

"SHINYLAND" STUDS

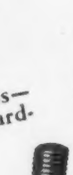
All studs made steam-tight on tap end unless otherwise specified, with flat and chamfered point. Nut end, oval point. Carried in stock.

SET SCREWS

Square head and headless—cup and oval point—case hardened. Carried in stock.

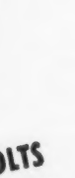
CONNECTING ROD BOLTS

Made of alloy steel—heat treated—threads rolled or cut—finished to extremely close thread and body tolerances—body ground where specified.



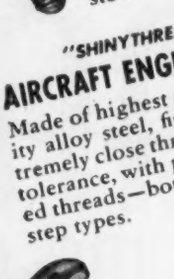
"SHINYTHREADS" AIRCRAFT ENGINE STUDS

Made of highest aircraft quality alloy steel, finished to extremely close thread and body tolerance, with precision rolled threads—both straight and step types.



VALVE TAPPET ADJUSTING SCREWS

Hexagon head style—to blueprint specifications—hexagon head hard; polished if specified—threads soft to close tolerance.



SPRING BOLTS

Case hardened to proper depth and ground to close tolerances. Thread end annealed. Supplied in various head shapes, with oil holes and grooves of different kinds, and flats accurately milled.

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the form of a new type of high speed steel with high red hardness and greater ability to resist shock and abrasion.

"Taps made of such steels, for example, enable the tapping of holes at drill speeds and even higher with actually less wear and breakage than was formerly possible at lower speeds.

"Developments such as these are essential if industry is to be able to reduce manufacturing costs. This is vital if we are to reduce prices on manufactured articles and still operate at profit."

Obtain Important Data on Carbide Milling from Research

O. W. Boston, professor and chairman, Department of Metal Processing, University of Michigan: "During the early part of the war, the War Production Board realized that a great deal of technical information was needed in the manufacturing industries, particularly the small ones, in order that the output of each machine tool could be maintained at or near a maximum.

"With this idea in mind, the WPB, through its Office of Production Research and Development, asked the American Society of Mechanical Engineers to set up a Manufacturing Engineering Committee to appraise projects and advise in their conduct when started. This committee studied the problem and suggested to the OPRD that two programs on the subject of milling be initiated—one to be conducted at the California Institute of Technology near the aircraft industries who, through their Aircraft War Production Council, had made such a request for support to OPRD.

"This project was to cover the carbide cutter milling of steel, the carbide milling of nonferrous metals, and a study of instantaneous cutting forces by means of the oscilloscope. A second program was planned to be carried out at the University of Michigan under the principal heading 'The Milling of Cast Iron and Ferrous Alloys' in which cutter materials of all types were to be used.

"As these programs got under way, reports were issued by Raymond C. Catland, supervisor of the project at C.I.T., and by the author, supervisor of the project at the University of Michigan. These reports were sent to the ASME Manufacturing Engineering Committee for publication in their monthly bulletins, 'Data Sheets,' beginning in March 1945, and running until the termination of the contract in October, 1946.

"These two programs, running simultaneously, were financially sponsored by WPB, as was the publication of the data. After their termination dates with WPB., both projects were then carried on by the Navy Department through its Office of Research and Invention and further reports were published on a subscription basis by ASME. The first 'Metal Cutting Data' is dated July, 1946. This publication covers, in addition to milling data dealing with single point tools, drilling, threading, etc., and also each includes a sheet of bibliography."

Hard Carbide Tools and Parts Found in Many New Applications

Philip M. McKenna, president, Kennametal Inc., Latrobe, Pa.: "During 1946 machine shops and metalworking plants were faced with the necessity for improved efficiency in operations to maintain high wage rates. Hard carbide tools, milling cutters, rolls and wear-resisting parts were increasingly adopted.

"The scope of jobs which could be done with carbide tools was increased by the development of tools and tool blades of solid hard carbide used by mechanical holding without brazing to a steel shank. An example of this is the solid cemented carbide grooving tool applied first in piston grooving of aluminum alloy pistons.

"Formerly, tools made with small tips of carbide brazed onto steel shanks dulled after 800 pieces, whereas solid grooving tools of the same material throughout have grooved 18,000 to 20,000 pistons before regrinding was necessary. The reason, of course, is that the slender blades 'weave' considerably when made with steel shanks, whereas the solid hard carbide is a great deal stiffer, having a Y. M. E. of 90,000,000 psi compared to 30,000,000 for steel.

"Other examples are the milling cutters with positionable solid blades of hard carbide held by wedging; roll-turning tools having solid blades clamped onto accurately ground recesses in roll-turning tools for use in roll lathes having 'piano type rests' the tool being plunged into the work along a face as long as 8 in. Then there are broaching rings of hard carbide for accurately sizing bronze bearings, the solid washers of hard carbide being clamped; a variety of tools having 'clamped-on' or wedged-on tips, including solid rounds of carbide held 6 degrees from vertical in holes in shanks with saw-cut slots pinched together, and tools in which the tip is held in a recess by a light spring clamp, as well as tools for heavy duty, having high speed steel shims under the tips which are clamped into position.

"The recognition of the greater durability of such tools has increased the scope of jobs which were being done with carbide tools in 1946. Rolls of solid carbide of non-galling grade for cold rolling high carbon thin steel and alloy steel strips were another example of the use of articles of solid carbide in metal working in 1946. Seaming rolls, finger pads and wire guide rolls were increasingly adopted.

"As the year drew to a close, swaging dies of carbide had been in use, designed with better principles of construction than heretofore and phenomenally successful. The use of accurately polished balls of cemented carbide for sizing of drilled holes is still another example of the use of a solid carbide article.

"In the meanwhile, millions of the regular brazed carbide tipped tools continued to be successfully used, cutting costs in the field of work for which they are adapted and economical."

Centerless Thread Grinder Takes Powder Metals in Stride

M. A. Hollengreen, vice president and general manager, Landis Tool Co., Waynesboro, Pa.: "During 1946, we've made installations of several machines for the purpose of grinding powdered metals. Results have been unusually good; excellent thread form results with very high production. On one production run over 600,000 pieces No. 10—32 x ¼-in. were ground from powdered metal blanks at the rate of 120 to 130 per minute and the wheel still did not require re-crushing.

"Threading of this material by the centerless method is of particular interest because of difficulties experienced in other manufacturing methods. Cutting tools have short working life because of its (powdered metal) abrasive nature and single point wheels, accompanied by handling of each individual piece, naturally result in low output per 8-hour day.

"The combination of wide face multiribbed wheel and a vibrating type load-

DANLY PRESSES

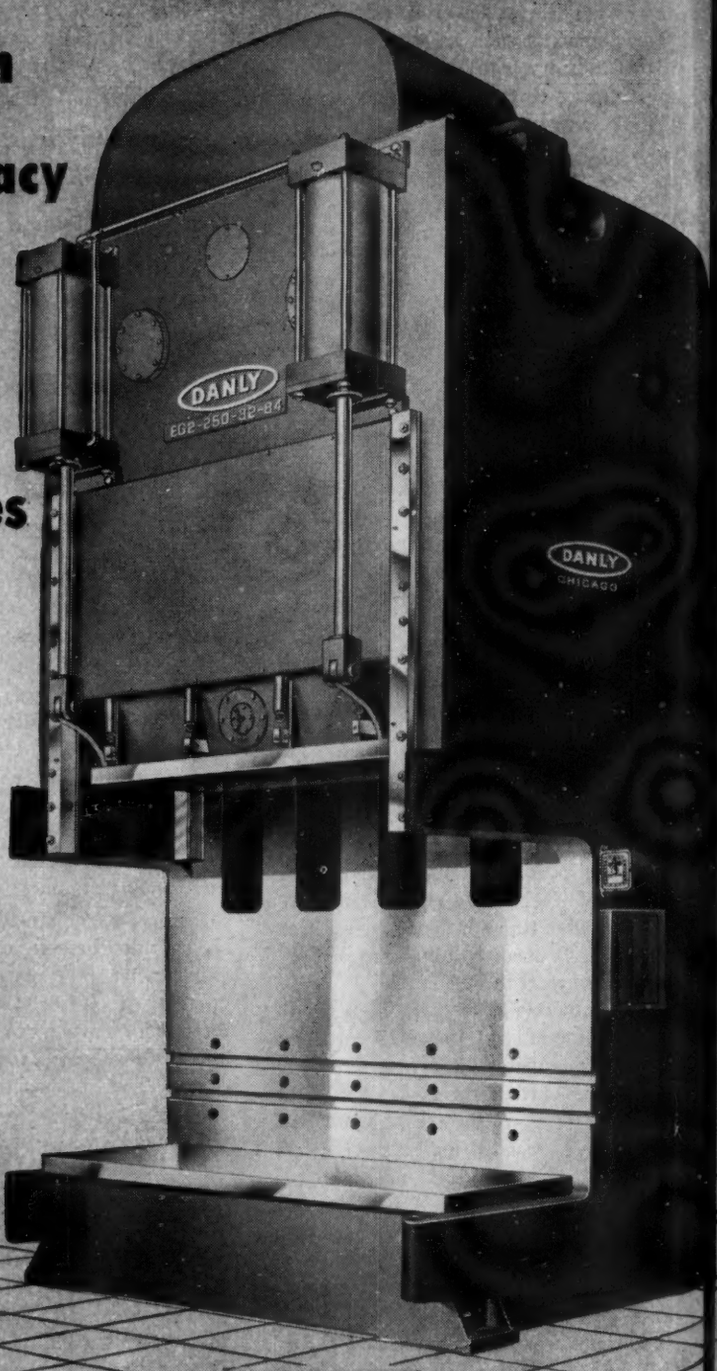
1 Rugged Construction

2 Mechanical Accuracy

3 Pressure Lubrication

4 Air-Friction Clutch

5 Modern Design Features



● INCLINABLE PRESS

The 100-ton, eccentric gear, Inclinable Press, *shown left*, has a unit frame—one piece cast steel or Danlyweld as specified, and an all-steel Danlyweld base. Extra long gibs and two suspension points—insure even pressure along the full length of the stroke, make for accurate alignment on large or progressive dies.

This press has an 8" stroke—operates 40 strokes per minute. Adjustment of slide—4" by hand. Bed area is 31" x 40"—designed to be equipped with air cushion if desired. Pivot point is so arranged that the center of the bed is not elevated when press is inclined. Distance floor to bed—33". Shut Height—19".

● GAP-FRAME PRESS

The 250-ton, 2-Point Eccentric Gear Gap-Frame Press, *shown above* is of all steel Danlyweld construction. Intermediate *continuous* structural members extend up through the back of the frame reducing deflection throughout the entire length of the bed. Gearing and driving members are completely enclosed within the frame.

This press has a 14" stroke—operates at 20 strokes per minute. Bed area is 32" x 84". Shut height—54".

. . THE PRESS for MODERN PRODUCTION . . .

● 4-POINT STRAIGHT-SIDE PRESS

Compact, enclosed construction keynotes the design of the 300-ton Straight-Side Press, shown above. Gears and driving members are completely enclosed within the frame.

This press has eccentrics cut on the four main gears and 4 Suspension Points—Extra Long Gibs. Bed area is 58″ x 96″. Stroke is 18″—Double geared to operate at 18 strokes per minute. Adjustments of Slide—12″. Shut height—54″. Air-Friction Clutch, Electric Stroke Indicator, and Push-Button Control—Motor Adjustment of Slide, are standard equipment on this model.

● HORNING PRESS

The 100-ton Eccentric Gear, Horning Press, shown above, has a one-piece cast-steel frame. Extra-long gibs and 2 suspension points—unusual features in a press of this type and size, make for accurate alignment on large or progressive dies.

This press has an 8″ stroke—operates at 40 strokes per minute. Adjustment of slide—4″, by hand. Shut height with knee adjustment down, slide adjustment up—20″; adjustment of knee—10″. Shut height with knee removed—39″.

DANLY

MACHINE SPECIALTIES

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2100 SOUTH 52nd AVENUE

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er insure a constant flow of practically identical parts.

"The centerless thread grinder does not limit work pieces to V-threaded parts; other forms which can be crushed into the wheel face are reproduced faithfully. One example is a worm ground on a shaft for a prominent electrical manufacturer. Acme threads have been generated over the entire length of five foot shafts, which are then cut into lengths to suit the application. The machine is also being used to produce annular teeth in circular racks.

"Precision grinding, as a process, continues to become more widely used by industry in general, each year."

Early Relaxation of British Import Controls Not in Sight

Frederick S. Blackall, Jr., president and treasurer, Taft - Pierce Mfg. Co., Woonsocket, R. I.: "Back from 3 weeks in England, as chairman of the American Gaging Mission to the Joint Screw Thread Unification Conference at London, I am impressed with a number of developments in international relationships which may have profound effects upon our American capital goods economy.

"It is, of course, well known that England's dearth of foreign exchange has caused her to impose import restrictions upon machine tools and many other industrial items. No machine may be imported without a license, and no license will be granted unless (a) the need is established; (b) no equivalent machine is manufactured in England; or (c) the British delivery is so much longer than the foreign and the immediate need is so urgent that importation is justified by the time factor alone.

"Some idea of the detail with which this control is being administered will be gained from the fact that the Ministry of Supply keeps an accurate record of delivery promises versus performance by American machine tool builders; and in judging comparative delivery promises, the would-be exporter's past record is given important consideration.

"While no prospect looms of early relaxation of British import controls, it is the intent of the British government, according to present expressed policy, to impose a closed economy permanently upon the British nation. According to a high official in the Ministry of Supply, restrictions will be lifted by gradual steps as the exchange situation improves, until at last a free and unfettered exchange in goods and equipment in international trade has been re-established. However, he added, it will be England's policy to initiate the manufacture within her own borders of any type of machine tool, heretofore imported, for which a sufficient demand exists to support economical production. England, he said, must be able, to the utmost possible extent, to procure her machine tool needs within her own borders, much as the United States itself is largely self-contained in this particular.

"Should this come about, the American machine tool builder, who has depended heavily upon exports to Britain in the past to tide him over slack periods at home, may find it necessary to establish a British branch or issue a British manufacturing license if he is to recoup the lost benefits of his export business."

Newer Gear Cutters Keep Pace With Modern Finishing Machines

O. L. Bard, president, Michigan Tool Co., Detroit: "Closer integration of production methods, for improved quality, plus reduction in total time for all manufacturing operations represent the most important advances in gear production during the past year. These trends promise to continue through 1947.

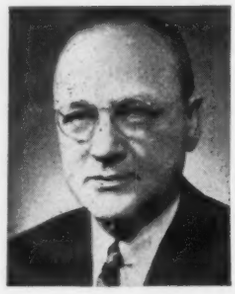
"Prime contributing cause, of course, is the high percentage of total cost now represented by wages. With industrial efficiency continuing at low levels, the only major avenue for cost reduction in gears is through the use of higher output machines. This is particularly true in the spur and helical gear field in which few fundamental advances—except for the introduction of gear shaving—had been made in almost half a century.

"Recently, however, several new types of gear cutting machines have been introduced which greatly reduce floor-to-floor time. Some of these machines are actually able to keep pace with modern gear-finishing equipment, machine for machine. Until recently it was not unusual to find one shaving machine taking care of the output of from 6 to 15 gear hobbers or shapers.

"At the same time, gear finishing machines have now also been further improved to such an extent that shaving time has again been cut in half on the newer machines. As a matter of fact gear finishing time is now generally reckoned in seconds rather than minutes.

"Availability of higher speed gear cutting machinery does not mean the elimination of gear hobbing or shaping, it should be understood. Such machines still form the backbone of our gear production. An important development here, however, is the greatly extended use of pre-shaving hobs and cutters which not only rough cut the gear but actually *prepare* it for the gear shaving operation. The result of this trend has been a marked improvement in gear quality."

Cost-Cutting Possibilities of Tools To Be Thoroughly Probed



Wendell E. Whipp, president, Monarch Machine Tool Co., Sidney, O.: "Today, industry is again being challenged to improve overnight on the wages it pays — without having much, if any, leeway left to recoup the added costs of operation from the users of its products.

"It is a situation which can very well threaten the very existence of some concerns. That they are the smaller ones in their respective fields makes it even more difficult to apply the remedy which is, of course, increased productivity.

"That increased production cannot be expected to come from employees alone is a foregone conclusion. In fact, some people are pessimistic enough to assert that little or none of it will come from employees, but will have to be achieved by a further mechanization of industrial processes and improvements in machines already installed in industrial plants.

"Here is where new machine tools, many of them radically improved over machines built only a year ago, will have a chance to demonstrate their cost-cutting possibilities.

"A machine tool built to be operated profitably by 65-cent-and-hour labor is not going to work out so well with $1.25 or $1.50 labor. It is going to take literally 'the last word' in modern machine tools to show operating savings on the

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Localized lighting, "floated" into position as easily and quickly as you move your arm! Push, pull, raise or lower it . . . swing, turn or tilt it . . . the Dazor fluorescent or incandescent lamp "freezes" into position instantly, without tightening or locking.

The double arms of these ingenious floating lamps—and the vertical section of the pedestal models—are built of OSTUCO Steel Tubing, selected for its strength-without-weight advantages. Here, as in countless other applications, OSTUCO research, testing, design and manufacture have combined to solve a complex manufacturing problem.

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new wage scales everywhere going into effect in industry.

"Higher speeds, new electrical and electronic controls, provisions for sustained accuracies far greater than the best obtainable in current models, more automatic features, are only a few of the contributions the strictly new machine tools will, I am confident, be able to make toward increased output per man-hour, increased real wages, and the maintenance of a high standard of living."

Merits of Crushed and Diamond Dressed Wheels Appraised

W. J. Grimm, assistant to general manager, Jones & Lamson Machine Co., Springfield, Vt.: "For the past year the spotlight on grinding has centered on operations performed by both diamond and crushed dressed wheels. New machines, as well as those already in the field, can be equipped for plunge grinding of ball race grooves, shifting fork grooves and a multitude of forms, including angles and radii as well as screw threads.

"Many tests were conducted for the purpose of accurately appraising the merits of crushed versus diamond dressed wheels. By discarding much of the published data on wheel crushing and approaching the problem from new angles, it has been possible to increase the life of the crushing roll, the number of pieces ground between crushings, and to improve the process in general so that the difference in overall production between the two methods of grinding has been greatly reduced.

"The diamond dressed wheel still is a leader in accuracy and if properly handled has considerable production advantages due largely to the fact that wheel selection is not restricted. Although crushed dressing is as yet limited to vitrified type wheels, it can be used advantageously on certain work.

"Multi-rib thread grinding equipment in varying types is available: (1) Three-rib diamond dressed, wherein the first rib acts as a rougher, the second as a semifinisher and the third as a finisher. Accuracy equivalent to that expected from single-rib wheels is obtainable, thus making it a satisfactory process for fine tool work and long threads. (2) A diamond dressed, alternate-rib wheel of a width equal to the threaded length and requiring approximately two and one-half revolutions of the work. (3) A full-rib diamond dressed wheel and (4) a crushed dressed wheel. Types 3 and 4 require approximately one and one-half work turns. All types of diamond dressing are completely automatic except for changing the work. Crushed dressing requires a few hand operations. From either the full-ribbed or alternate-ribbed, full-width wheel class, three fit standard threads are obtainable.

"Another interesting development is the automatic indexing headstock which automatically grinds multiple threads and worms. From two to 60 or more starts can be obtained by hardened and ground pick-off gears. The machine is completely automatic except for changing the work and is readily available for single lead threads.

"The development of gas turbines has created an urgent need for a means of checking the blade contours. The concave and convex surfaces, leading and trailing edges, taper and twist of the blades as well as the forging dies can be accurately checked on an optical comparator developed for the purpose."

Strategic Tool Reserve Is Essential for U. S. Security

Tell Berna, general manager, National Machine Tool Builders' Association: "The troubled outlook in world affairs certainly warrants the conservation of our war potential until the efforts of our State Department result in a firm and enduring understanding between nations.

"We can hardly maintain an army and navy of wartime strength, but we can conserve some of the industrial potential that we must have in case of national emergency.

"We had time to prepare in the years from 1939 to 1941, but we cannot be sure that we will be allowed even a brief period of hasty preparation when the next crisis comes.

"It follows that the machine tools built during the last war, to the extent that they are not needed by American Industry, should be kept in a strategic reserve. There are many machines which are not produced in time of peace, such as shell lathes, gun boring lathes, long stroke presses, etc., which cannot be found in industrial plants when war comes. They can neither be commandeered nor improvised. We have them now, but in the haste to dispose of the surplus, many of them have been scrapped, and the rest will be, unless constructive action is taken.

"The declining demand for the surplus machines indicates clearly that industry is nearing the end of the task of tooling up for peacetime production. The machines that are still unsold are the excess needs of war over peace. It is these machines that we may need, and need desperately, in the future. There is little value to be recovered by selling them as scrap, but in an emergency, they will be invaluable. The War Department had a few rusty machine tools on hand in 1941 stored in the Rock Island Arsenal. When our defense program started, they were promptly reconditioned and put to work. They were not as accurate or as productive as we would have liked, but they helped to bridge the gap until the machine tool industry could muster its resources and increase its output. When the emergency came, they were invaluable. We should have another such reserve now, but it should be very much larger.

"The importance of giving attention to the strategic reserve today lies in the fact that we can easily establish it now, but in a few months the opportunity will have gone beyond recall."

Surfaces Now Ground to a Few Microinches in Production Lots

Henry K. Spencer, treasurer, Blanchard Machine Co., Cambridge, Mass.: "In the field of production surface grinding as done on vertical spindle rotary table surface grinders of the Blanchard type, there has been in recent years a rather remarkable development in the direction of greater accuracy and finer finish. The ability of machines of that type to economically remove metal at a rapid rate is well known. It is not as well known that the same machines when fitted with the proper wheels, and properly operated, can grind metal surfaces flat within one or two bands, as tested with an optical flat, and to a finish of a few microinches. The production of such surfaces is not something done only in the laboratory under carefully controlled conditions but such surfaces are actually being produced regularly in production on thousands of pieces.

"As in most such important developments, the remarkable results now obtained are not due to any single improvement but are the cumulative results of improvements in the design of the machine, the grinding wheels, and the technique of operation.

"Further study and experiments will

The Hand on the Doorknob . . .

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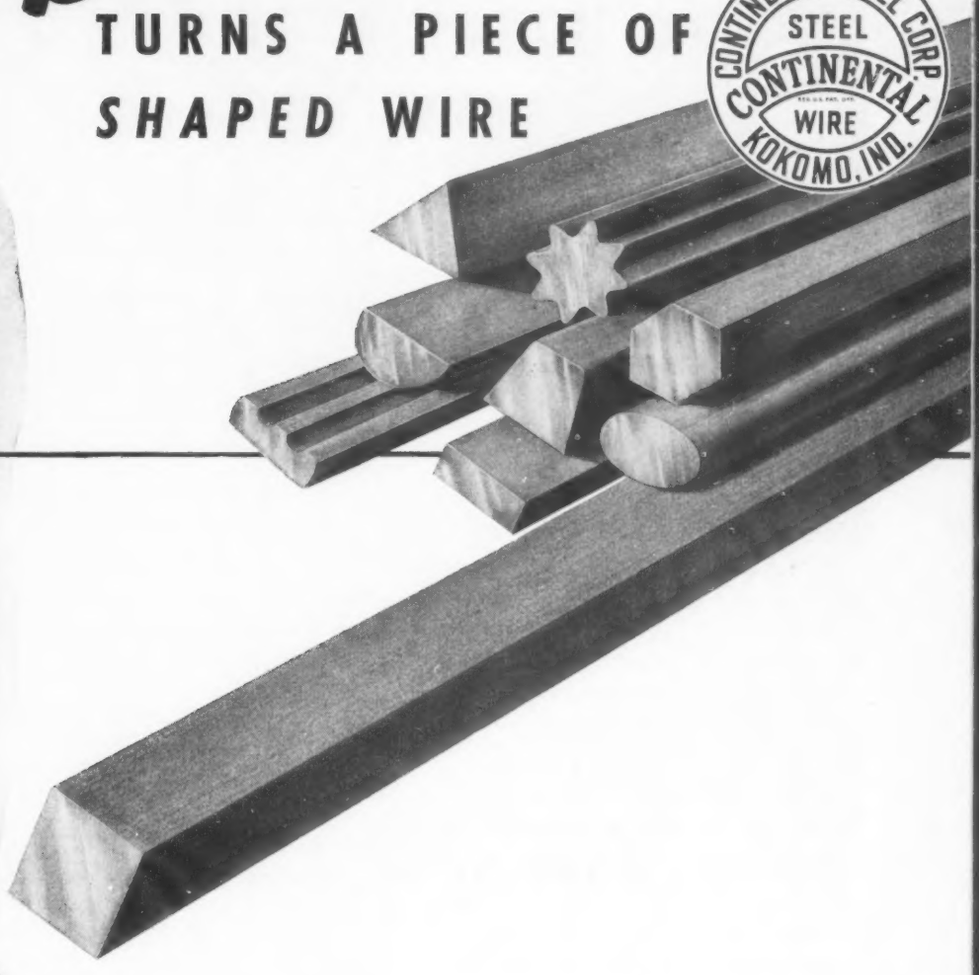

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undoubtedly carry us further in this direction, for no definite limit has yet been reached. Naturally, the progress may be slower from here on because, as we approach closer and closer to perfection of flatness and finish, the technical difficulties increase, and having already reached on some work the flatness of one band of light and a finish of two microinches, the room for further improvement is considerably less than when we were working at the level which had been reached some years ago.

"We can look for further improvement along this line, leading to important cost reduction through being able to produce these accurately flat and high finished surfaces on machine parts by grinding, without the necessity of any further finishing operation."

Sound Engineering of Thread Making Tools Insures Future

C. N. Kirkpatrick, president, Landis Machine Co., Waynesboro, Pa.: "The end of the first postwar year has brought some rather amazing changes in the practice of a number of machine tool builders. We learn that one machine tool builder has added road machinery and textile machinery to the line. Another now includes in its manufacturing a line of valves and transmission machinery. In fact, many machine tool builders have felt it necessary to expand their lines of manufacture to keep in operation their expanded facilities and expanded personnel which were acquired during the war period.

"The American machine tool builder, with his usual foresight, knew 4 or 5 years ago that the day was coming when, to assist in maintaining a high level of employment, allied as well as non-allied lines would have to be added to regular efforts. Post-war committees were organized and serious thought and research were given to lines that could be developed and handled, not only from a profit standpoint, but more perhaps with the view of maintaining as high a level of employment as possible, both of men and machines.

"Our efforts have been devoted to the manufacture of machinery and equipment for the production of threads. Prior to 7 years ago, all of our efforts were devoted to the cutting of threads. With the advent of the war, we were requested to add the grinding of threads to our line. Now in the post-war period, we will not only develop our line of center type thread grinding machines, but the trade will have the advantage of employing the centerless thread grinder for many phases of thread cutting work.

"Thead rolling cannot be overlooked, and this has had our attention for some years. We have not been satisfied with conventional thread rolling methods. We have believed that a better and more unique method of thread rolling could be developed, and this has been the result of very determined efforts on our part during the past several years. We will soon have ready for announcement a type of thread rolling machine that is radically different and one that will be very attractive, both from the standpoint of high productivity and low threading costs.

"Also in the thread rolling line we will have to offer in the very near future a thread rolling device for application to automatic screw machines, turret lathes, etc. This thread rolling device will be the first—so we believe—to prove itself entirely satisfactory. Many attempts have been made to develop a thread rolling device for automatic screw machines and turret lathes, but none have been entirely successful. The new thread rolling device, we know, will have great appeal to those who want to roll threads as a secondary operation on automatic screw machines etc.

"With the continued improvement that we know must occur in thread cutting equipment, and with the development of thread grinding and thread rolling to a stage not attained before, we feel that the future for us is filled with much determined engineering effort, research, and development. The outcome, we are confident, will be for the improvement generally in the production of threads."

Press Builders Standardize To Meet Heavy Demands

George E. Bass, president, Ferracute Machine Co., Bridgeton, N. J.: "If we review this past year we find that the close of the war has influenced in many ways the manufacture of metalworking presses and methods of press users in utilization of presses on their work.

"The result of the overwhelming demand by consumers of products unavailable during the war has created an unusual market for and a resulting high production of presses. This has led the press builder to many steps to increase the number of machines manufactured. The consumer demand has also enabled the press user to strive for the greatest production.

"One of the effects of this general market condition has been a trend toward standardization of the presses built. If fewer changes in designs and patterns are made, more machines can be built with a given organization, and it has been in the interest of the press builder and press user to standardize as much as possible. The press builder has welcomed and encouraged this tendency toward standardization, since he was plagued by customers in the buyers' market of the thirties requesting so many departures from standard that almost every machine became a special product, greatly increasing the cost of manufacture, and reducing output of the machine builder.

"This increased demand has also placed the press builder under greater pressure to adopt in his jobbing shop, as many as possible of the mass production methods, which cannot be used in the manufacture of a smaller number of machines. Tighter inspection and material control has been established, interchangeability of parts pushed with a wider use of jigs and fixtures. The press builder has been under pressure to apply the newest methods of tooling his own machine tools in order to obtain maximum production of parts incorporated into presses. He has even subcontracted broadly to obtain parts for which he doesn't have the manufacturing capacity. In this respect he resembles the automobile manufacturer.

"Certain changes in the construction of presses themselves have largely resulted from these postwar conditions. Because of the difficulty of obtaining castings from foundries as well as other reasons, there has been an increasing use of weldments in presses. More frames and other major elements are being fabricated from steel plate, flame-cut and welded into strong, rigid units.

"The non-availability of certain kinds of other materials has brought about substitution of steel usually used, very often to the improvement of the product. There is a tendency too toward a wider use of friction clutch on smaller machines. The broader use of the die cushion and feed rolls has increased the flexibility of the standard inclinable press.

"The hydraulic press has been greatly improved in the recent years and is finding broader application than hitherto believed economical.

"In the press user's plant too, we find the influence of increased volume. There is an increasing demand for high-speed and transfer feed presses with progressive

(*Please turn to Page* 311)

"Let's change this cast part to a forging . . .
. . . better get in touch with Tube Turns"

NOTHING equals a forging for ability to take a beating. Forgings are not subject to the weaknesses characteristic to castings — porosity, shrinkage cracks, hot tears—the cause of many rejects and failures. Many a mechanical product can be strengthened and improved by changing to forgings for vital parts. So send your prints for the recommendations of TUBE TURNS' engineers. Get lined up for some realistic production by an outstanding forge shop. Forgings *can* be had, if you deal with TUBE TURNS—better forgings.

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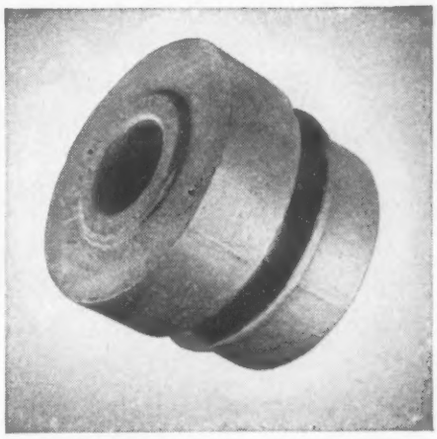

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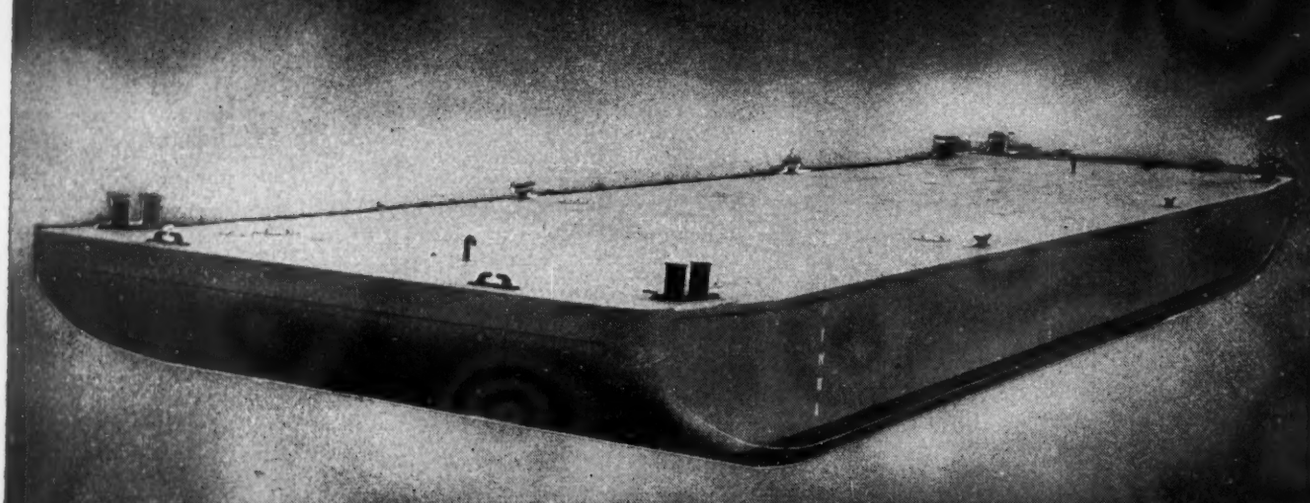

Liquid—dry cargo—drilling rigs—derricks. Look over our stock designs—or let our engineers design a barge to suit your particular needs.

Pictured here is an all-purpose barge to meet post-war requirements. It can be used for either deck or liquid cargo. Notice the long, plated rake—for swifter, easier towing. Dimensions: 110' x 30' x 7'. Capacity: 450 tons of deck or 3,200 barrels of liquid cargo.

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Equipment

New interest in hydraulic controls for rotary motion . . . Steel industry "loads" motor builders with orders . . . Adjustable drives needed for production spurt . . . Overworked hydraulic systems suffer from shortages

Hydraulic Control of Rotary Motions Creates New Interest

L. R. Twyman, administrative staff, Vickers Inc., Detroit: "From the time ore is picked up until the finished products are ready for shipment many process steps that use hydraulics come into play. The metalworking industry employs hydraulic control with such diversification that the technical progress picture varies widely with the class of application.

"Control of staight-line motions by this means—forming, straightening and stretching operations of the industry—are quite well known. Also well established are the hydraulic controls that provide adjustability of feeds on machine tools. But control of rotary motions by hydraulic devices, although very old in principle, is a convenient method only now coming into general use.

"Two reasons for this new interest in rotary motion drives are: (1) Rotary hydraulic motors have but recently come into an era of intensive development; (2) Interest in adjustable speed devices has increased greatly, due to more exacting requirements for the correct drive speed at all times.

"It is possible to provide automatic or manual adjustability, regulation, automatic tension control with varying diameter reels, rapid but shockless reversibility, and numerous other desirable results with rotary hydraulic drives. Extremely simple control devices sometimes handle seemingly complex power application cycles.

"As designers become better acquainted with these possibilities there will be many additional applications made—to payoff and winding reels, to rolls, and to process operations requiring adjustability in stepless increments of rotative speed. It is interesting to note new developments that already have been made since the end of the war. In some cases rotary hydraulic drives are used with all-hydraulic control circuits. In other cases they are tied in so they instantly respond to electrical control circuits that signal remote conditions of temperature, pressure or processing rate.

"The self-contained hydraulic variable speed transmission is a convenient form of rotative drive that delivers adjustable or regulated speed while being driven at constant speed. It is fully enclosed. Smaller and more compact models are now making their appearance, and they may thus be fitted into jobs where they have not previously been considered.

"Much progress has been made in postwar designs of valve controls and other equipment items for all classes of hydraulic circuits. Newer, more compact, and more easily applied devices have been announced. They are of interest to all designers who are following the trend toward greater automaticity, yet who do not wish to introduce too many intricate accessories."

Improved Couplings To Widen Use of Direct-Connected Units

John H. Schmid, vice president, engineering, American Flexible Coupling Co., Erie, Pa.: "Postwar examination of numerous wartime installations for mechanical power transmission has proved the value of careful consideration of alignment problems in design and maintenance of metalworking equipment. The prevention of bearing and gear failures in direct-driven equipment by the elimination of misalignment stresses has proved of major importance. In the future, it is reasonable to expect that scheduled maintenance in conjunction with well designed flexible shaft couplings should make bearings the last source of trouble in any engineered unit.

"New machining methods, affording better control of finishes and fits, now permit production of gear couplings that give full bearing protection at the highest speed and for the full life of the equipment. Also new selflubricating materials have even further improved the fully-floating center member type of coupling. This type of coupling will be in production shortly with selflubricating bearing strips floating freely between the coupling flanges and the center member; this improvement will lengthen the service of the replaceable strips, and decrease even further any friction in the coupling.

"It is felt that most designing engineers are now aware that a flexible material (rubber, leather, metal strips, etc.) in a coupling must transmit misalignment stresses to the bearings. With the improved couplings now available, which employ only rigid parts and afford flexibility through design, the use of direct connected equipment can be broadened appreciably."

Latest Fire Control Systems Stop Equipment and Start Pumps

H. N. Rider, manager, technical division, "Automatic" Sprinkler Co. of America, Youngstown, O.: "Present day fire protection is more scientific than most people realize because of the necessary engineering and design of control devices and system layout caused by the many new manufacturing processes and new materials.

"Experience has taught that the speed in detection of fires is most important. This is accomplished by means of air thermostats that operate on the rate-of-rise of temperature principle. This means that the ambient temperatures have no effect on the speed of operation as 'rate-of-rise' systems operate with great speed whether the ambient temperature is high, such as the case might be in a drying oven, or low as it would be a cold storage plant. These systems can be adjusted to 'ride' normal temperature changes that occur in manufacturing processes and at the same time be fast in the detection of fire and operation of the control valve.

"The rate-of-rise of temperature meth-

od of control is used to operate all kinds of fire extinguishing materials, such as water systems, carbon dioxide, foam, and dry powder systems. For the steel industry, these new systems have many applications.

"Pattern shops and pattern storage building must have fire protection systems that operate quickly because of the high values and to prevent water damage. The curtailment of water damage is easily accomplished by means of an alarm prior to the opening of a fixed temperature sprinkler system. Speed is further possible because the sprinkler system piping can be empty, except for a low supervisory air pressure. The control valve is operated by the air thermostats well in advance of the operation of the sprinklers. The piping is filled with water and at the same time an alarm, either central station or local, or both types of alarms are given. There is sufficient time between the opening of the control valve and an automatic sprinkler to extinguish most fires before excessive water damage occurs. Further, this type of system is designed so that if the sprinkler system is damaged, an alarm is given without spilling water as would happen in the old type systems.

"Rate-of-rise systems are valuable in electric shops and any other part of a steel plant where speed is important to prevent water damage and where an alarm is important if the water supply should be shut off.

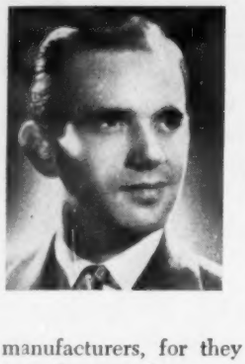
"Water spray systems are available for protection of tankage such as gasoline, fuel oil, lubricating oil, benzol, naphtha, and other low flash point materials in the liquid, gaseous or solid state. In some cases extinguishment is not possible but in all cases it is possible to burn these fuels under control without damaging to any extent the building or other structures that are adjacent to the burning material.

"Water spray systems also are used to protect electrical transformers, oil filters and quench tanks. Need for quick, automatic action is the basis for its selection in the first two cases, and there is little loss of time and material and no clean up necessary when quench tank fires are extinguished almost instantaneously.

"Additional uses of water spray are around loading racks for flammable liquids and at storage points in oil fuel boiler rooms. A very unique use of high-velocity water spray is in descaling sheet steel to reduce pickling time. Another is in the uniform cooling of billets, bars and rods without warping.

"Auxiliary rate-of-rise devices are available to perform any electrical or mechanical work required when a fire exists. Electric switches built into the control valves will stop conveyors and fans and start fire pumps."

Variable Speed Controls Become Built-In Equipment



J. P. Reeves, Reeves Pulley Co., Columbus, Ind.: "The words 'built-in' in the term 'built-in' variable speed on a modern milling machine' mean quite a bit to many manufacturers, for they can incorporate into their machines a complete variable speed mechanism without the loss of expensive space and at the same time place before the buyers a modern, streamlined machine with all working parts under one compact cover.

"Indicative of the enterprise of American industry in its preparation for the battle to provide full employment are the new Reeves-equipped Reed-Prentice milling machines, manufactured by the Reed-Prentice Corp., Worcester, Mass.

"Two years ago they called in our engineers to assist the company in its redesign plans. The object, of course, was to give the milling machines the utmost in productive efficiency and salability by providing infinitely variable speed control of proven accuracy and dependability.

"For these installations there was provided a standard No. 4000 Motodrive internal parts and Motodrive electric remote control. A 3 hp alternating-current motor with integral variable-speed mechanism and power driven speed change provide a range of spindle speeds from 90 to 2200 rpm in stepless progression. The electric remote control is complete with control cover and shifting equipment connected to the constant speed disk assembly.

"The machinery manufacturer designed and built his machine frame to incorporate our parts to our standard dimensions. In the Model 12-V miller, the motor is flange mounted to the Motodrive case, and the case has a long extension on the variable shaft end supporting the spindle and milling head.

"This is one example of the manner in which speed control engineers can work with the engineers of machine builders to incorporate speed controls within the framework of the machines as standard equipment. To our definite knowledge, many other machine builders are working in the same way to give their customers all the advantages of infinite speed adjustability for the big postwar production jobs."

Electrical Apparatus in Steel Industry Marks Advancement

G. E. Stoltz, manager, metal working section, industry engineering, Westinghouse Electric Corp., East Pittsburgh, Pa.: "Postwar modernization program of the steel industry has produced the heaviest manufacturing load for the large electrical manufacturers that has been experienced in any previous war or peace period. Rolling mills and auxiliary processing lines are being installed to reduce manufacturing cost by adopting straight line manufacture, a reduction in rehandling and use of higher speeds. Such installations will show to greatest advantage when it is possible to produce large tonnages of a particular product rather than small lots of a large variety of materials.

"Since 1930 there have been a number of blooming and slabbing mills installed utilizing twin-motor drive; one motor is used to drive the top roll direct and the other motor the bottom roll. Sufficient experience has been had with these drives to recommend their use on smaller blooming mills. A 46-in. 2-high reversing blooming mill has just been purchased which will be driven by an 8000 hp twin-motor drive. This mill will roll blooms for a secondary blooming mill.

"Sufficient experience has been had with twin-motor drive on a large plate mill to warrant the selection of this method of drive for future plate mills. Elimination of gears has been found to be of considerable advantage on this type of mill.

"On rod and continuous tube mills increased flexibility is obtained by the use of d-c motors. They may drive an individual stand or several stands. The seamless tube mills are equipped with an individual motor for each stand.

"It is important to keep to a minimum the speed drop at the instant metal enters the rolls. To accomplish this a number of mills are now in the process of manufacture which includes electronic control to minimize the entry drop in speed. This insures a better section of the product rolled.

"There is a continuing increase in speed of both cold tandem sheet and

tin plate mills. A number of 3 or 4-stand sheet mills are being designed for a maximum delivery speed of 3000 fpm and tin plate mills having maximum normal delivery speed of 4000 fpm, with a maximum possible speed of 5000 fpm. Some of these mills are being installed with twin-motor drive on the last two or three stands. In order to avoid large angles in the driving spindles each motor is provided with an offsetting gear.

"Processing lines are tending to higher speeds and are provided with variable-voltage electrical equipment which is required to maintain tension in some parts of the line and loops in other parts. The application of electric equipment to these lines is as involved as that required on tandem cold sheet or tin plate mills.

"During the war period it was the opinion of many that there would be no particular postwar demand for electric arc furnaces. In the last few months there have been three large furnaces purchased, two having a capacity of 70 tons and one, 60 tons. Another activity that is continuing during the postwar period is the production of aluminum. Most of the rolling mills are in full operation and there is a possibility that there will be some modernization in production of aluminum such as we have been experiencing in production of steel."

New Regulators for Voltages, Current and Speeds Appearing

R. A. Gueder, Reliance Electric & Engineering Co., Cleveland: "One of the very interesting developments of the past year has been the fashion in which concurrently with more and more applications of adjustable speed drives, an increased use has been found for automatic regulators to control speeds, currents, and voltages.

"The result has been that, in addition to using regulators built by other manufacturers, Reliance has found it advisable to design and put into production two regulators of its own. One is a rotating electrical unit, the other its electronic counterpart, with electronic tubes replacing the rotating elements.

"Basically, all electrical regulating devices of this nature are voltage regulators and consist of four elements: (1) A control signal, (2) a control reference, (3) a limit reference, and (4) an anti-hunting device. In some instances, a fifth element may be introduced—to compensate for inertia.

"Applied as a voltage regulator for a generator, for example, the new Reliance regulator responds to changes in generator potential to add or subtract sufficient field excitation to maintain generator voltage at the desired level. On the other hand, applied as a tension (current) regulator for a winding reel motor, the new regulator responds to any change in the latter's armature current to increase or decrease its field excitation sufficiently to restore the motor load to the desired amount.

"The new rotating type regulator consists essentially of two motor-driven exciters, one a control unit, the other an amplifying unit. The former is wound with as many as six separate sets of fields, each designed to supply a specific amount of excitation for a particular function of the equipment being controlled.

"One of the control fields is called an anti-hunt field and is excited from the output of the second exciter, either through a transformer or condenser circuit so that it is energized only during an actual change in this unit's voltage. Its magnitude, of course, is in proportion to the rate of change and its polarity opposite to the direction of surge which it consequently offsets effectively.

"Another field is called a 'reference' field inasmuch as its excitation is used to establish a basic strength against which the other fields work.

"A third field, established by the medium to be controlled, is called a 'signal' field. If, for instance, the regulator is being used to control current, then this 'signal' field will be directly proportional to the current to be controlled, and equal and opposite to the 'reference' field. Any change in the signal value will, under such circumstances, serve to restore equilibrium between reference and signal fields.

"The fourth or 'limit' field is the equivalent to the stop on a mechanical regulator. Usually incorporated in a 'spill-over' circuit to render it ineffective until the value for which it is set is exceeded, the function of this field is to protect the regulator against a too rapid shifting in the forcing currents of the other fields already described.

"In some cases, a fifth field, called the WR^2 or inertia field, is also provided. This field is introduced to provide more current during acceleration, less during deceleration, to offset the inertia present in, for example, a tension control application.

"The regulator is very simple to maintain since its component parts are standard conventional direct-current exciter or generator elements. What is equally important, it is easy for the plant electrician to understand and requires little adjustment."

Adjustable Voltage Drives in Demand for Production Spurt

L. W. Herchenroeder, engineer, Industry Engineering Department, Westinghouse Electric Corp., East Pittsburgh, Pa.: "The increased production being required of modern machine tools is resulting in more extensive use of adjustable voltage drives. The advantages of wide, stepless speed range provided by adjustable voltage drives has been recognized for some time for feed drives and they are now proving increasingly attractive for main drives for lathes, boring mills and other machine tools. Stepless speed range permits selection of the optimum speed for a particular job. Setup time is considerably reduced due to the ease of making speed adjustments. Adjustable voltage drives are readily adapted to cycle operations on automatic machines.

"Adjustable voltage drives are being used on hoists where high operating speeds and close control of creeping speeds are required for accurate spotting of the load. Good speed regulation at all speeds and smooth transition between operating points are obtained. Maintenance is greatly reduced as the use of large contactors is eliminated.

"Structural steel replaces cast-iron in a new series of induction motors recently announced. Size of the motors has been reduced 35 per cent without sacrifice of electrical characteristics. The frames are rolled from steel plate and the end brackets and feet are pressed steel. The steel sections are as thick as they would be if made from cast iron which results in a rugged motor having high shock resistance. Extensive use has been made of interchangeable parts to obtain the various enclosures including drip-proof, splash-proof, and totally enclosed fan cooled. The motors are equipped with prelubricated sealed ball bearings that may be run without lubrication for 5 years.

"The magnetic strain gage shows great promise for the measurement of loads on the frames of structure and machines. An experimental installation has been made on a crane with promising results. The strain gage was mounted on the back stay of the crane and the tipping moment was indicated by a meter. The magnetic strain gage can also be used

as an element of a torque meter to measure the torque transmitted by shafts.

Product Appearance Recognized And Valued as New Sales Tool

B. A. Lee, apparatus appearance supervisor, Central Engineering department, Westinghouse Electric Corp., East Pittsburgh, Pa.: "The value of appearance design to industrial apparatus is recognized more today than ever before and demand for it is steadily increasing.

"Manufacturers of home appliances were the first to realize the value of appearance in selling products and the combined efforts of engineer and appearance designer as applied to mass-produced appliances has advanced that field far beyond that of the industrial machine. Mass production and simplified manufacturing are necessary to our present economy and the ability of the industrial or appearance designer to reduce things to their essentials and still retain good appearance places further stress on his usefulness.

"War-born discoveries in every field of endeavor have advanced our manufacturing possibilities to a new high and mass production methods using these discoveries have produced war products in undreamed of quantities. We must continue to use these methods in peace if our American way of life is to continue. The industrial designer is one means toward that end."

New Equipment Helps Quality Of Malleable Iron Castings

James H. Lansing, consulting engineer, Malleable Founders' Society: "In the malleable iron casting field, progress during 1946 was in improving operating efficiency and working conditions while maintaining quality standards.

"Attention has been focused in many cases on the annealing departments where a plant's entire production must be handled twice, that is going into, and coming out of, the anneal. In addition, containers and packing materials, if employed, add to the handling requirement. Various types of mechanical handling equipment have been installed and, in every case, accompanying steps have been taken to improve working conditions through dust elimination and reduction in the weight of any loads to be individually handled. Metal, fuel and sand handling equipment has also been expanded in the industry.

"Experimental work in the development of a type of test bar which more accurately reflects the properties of malleable iron castings has also been in progress. Control of melting and annealing equipment has aided in excellent control of the product. In the annealing equipment field, an oven employing fans to circulate the oven atmosphere and cooling coils to effect a quick drop to the second stage annealing temperature has been effective, economical and will doubtless have increased future use."

War Strains Imposed Penalty on Efficiency of Hydraulic Systems

S. B. Taylor, president, Parker Appliance Co., Cleveland: "A tight, long-life hydraulic system is one war casualty whose disappearance has not yet been everywhere recognized. On the one hand, the tremendous demand for tube fittings and valves for aircraft production meant that practically no precision fittings could be made for industrial use. On the other, maintenance forces skilled in tube fitting and system layout were dissipated through the draft and other manpower displacements.

"Because proper equipment was not available, makeshift materials had to be resorted to; and the men who had to cope with the problems of maintenance and reconditioning under accelerated production schedules were often not properly trained to do the job required. The natural result of these circumstances has been 'trouble' in plants across the country. In many cases, the decline in standards during the war years went by unnoticed.

"Today, however, the penalties are being assembled in the form of leaky systems, which mean dangerous housekeeping, lost efficiency, wasted oil, and frequent breakdowns which interfere with production. These difficulties have been so serious in some plants as to give hydraulics a 'black-eye.'

"Materials for first-class installations are once again available, I am glad to say. Here at Parker, recently completed reconversion has seen the reinstatement of full lines of precision industrial fittings and associated equipment. A number of new designs of both fittings and valves has been introduced, reflecting war-interrupted development as well as war-gained experience.

"In the matter of developing the special skills needed for successful hydraulics servicing, we have been able to suggest personnel training procedures for a number of manufacturers, and are glad to extend such recommendations wherever required."

Close Tolerances Demand Even Greater Precision Tools

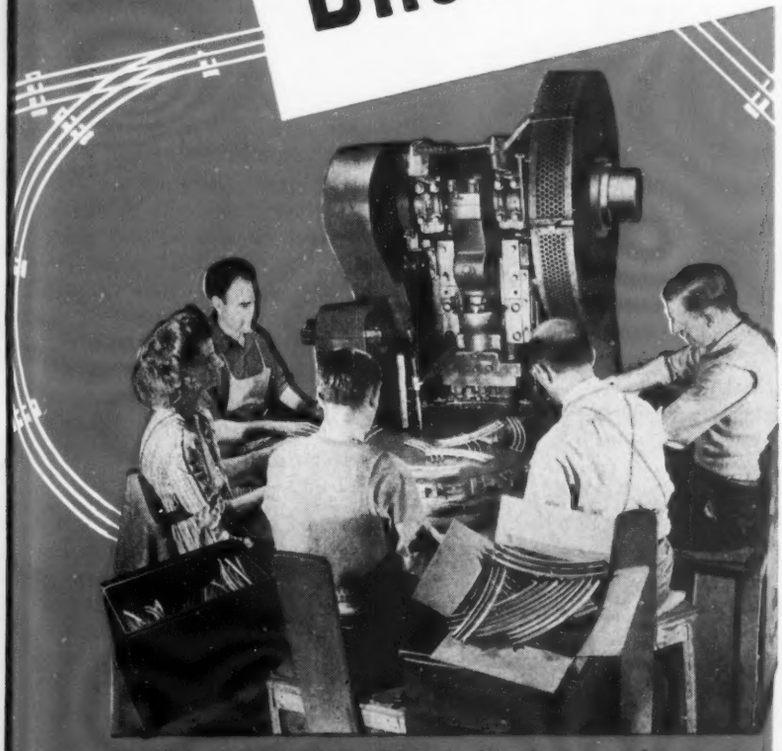
A. G. Bryant, vice president, Cleereman Machine Tool Co., Chicago: "Since Eli Whitney first made possible mass production through the introduction of the principle of interchangeability of parts, one of the most significant developments in metalworking practice has been the creation during the war of a demand for extraordinary accuracies.

"In countless products the economic manufacturing methods necessitate working tolerances which a few years ago were identified with only a few items. Precision which prior to the war was identified only with gages and other traditionally accurate tools and parts is now becoming commonplace. Whereas previously accuracy was related largely to the ultimate product, it now is a requirement for efficient and economic production.

"Accordingly there has developed a need for the application of jig borer precision to many plants and to many production departments whereas formerly the jig borer was known primarily to the toolroom and the gage shop. Along with this has come a demand that jig borers themselves offer something finer than mere assistance in the laying out of jigs and fixtures. With the greatest precision that can be built into any machine tool there now must be added convenience of

(*Please turn to page* 384)

Bliss' Stamping Grounds



RAILS AND TIES for Lionel electric toy trains are assembled at the rate of 1250 per hour in this Bliss No. 21 Inclinable Press with 48", 8-Station Bliss dial feed and a staking die.

MINIATURE PRESSED METAL VERSIONS of the "real thing" are the toy manufacturers' contribution to a youngster's world of make-believe. Authentic streamlined electric trains that puff smoke, futuristic autos and planes, miniature typewriters, refrigerators, jeeps, tractors...all are "musts" in playing grown-up.

As you'd expect, Bliss leads the stamping press parade in this ever-changing march-of-the-toys, for Bliss makes every type and size of press—mechanical and hydraulic—necessary to blank, draw, form and assemble an endless variety of playthings, as well as their counter-parts in real life. While one Bliss press is busy forming the entire turret top of *your* new car, another is stamping its toy copy for the kids. A massive 2500 ton press blanks two boxcar chassis frames at a stroke, while smaller machines complete whole miniature "railroads" for the "living room express."

Toyland is but another of "Bliss' Stamping Grounds." Here, too, as in so many mass-production industries, Bliss equipment contributes mightily to profitable low-cost manufacture. In some way Bliss press-building experience—90 years of it—can help in solving your production problem. Try putting it up to Bliss.

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Heat Treating

Gas cyaniding now on commercial basis . . . Continuous-type equipment in demand . . . Closer control available for induction heating and melting

Trend in Induction Heating and Melting Toward Closer Controls

R. N. Blakeslee, vice president, Ajax Electrothermic Corp., Trenton, N. J.: "Several installations originally designed for high-frequency heating of ordnance parts have been and are being converted to steel and nonferrous melting with Ajax-Northrup furnaces. This is significant because the largest part of the original equipment investment is saved. Conversion cost includes new furnaces, changes in controls, capacitors, etc.

"One company recently installed a number of Ajax-Northrup furnaces for centrifugal casting of white iron. Combination of closely controlled melting plus precision of centrifugal casting means a tremendous reduction in amount of metal melted per pound of finished product, due to uniform high quality and fewer rejects.

"During the year a number of furnaces have been installed for precision casting, particularly of brasses and alloy steels. Reason—close control over composition and pouring temperatures, low loss of expensive constituents, and savings in alloy additions required. Some of these installations have been relatively large capacity furnaces.

"A swing is shown to induction heating for forging, because of its speed, lack of scale, longer die life, low unit heating cost and ability to produce proper temperature gradient in billets, with close control over all.

"One large installation originally set up for forging shell is now being converted to heating for forging automotive parts. In another automotive plant, a new induction heating installation is being set up. New automatically timed heaters will be placed right next to the forging machine and will feed hot billets every few seconds!

"Special furnaces are now in use on many new development projects that cannot be mentioned yet. Many of these are for melting in vacuum or controlled atmospheres. In some cases, the specifications arrived at from this development work can be reproduced only in larger furnaces when they get into large-scale production.

"A significant application of Ajax-Northrup melting is the Cenco-Derge oxygen determination apparatus, which permits 10-min analyses of oxygen content in molten iron and steel."

Gas Cyaniding on Commercial Scale Proving Successful

R. J. Cowan, metallurgical consultant, Cleveland: "The process of continuous gas carburizing is widely used, but its companion process, which employs ammonia along with the carburizing gas was slow in taking hold. Gradually, however, gaseous cyaniding, as it is called, is making a place for itself, and at present a number of rather large installations are in operation.

"The product has distinctive characteristics. These differ from both carburized and nitrided cases. The metal is first carburized to the desired depth and then nitrided at a lower temperature during cooling. Cooling is retarded by holding at a predetermined point and nitriding is then superimposed on the carburized base. This provides an adequate base for the nitride case.

"The case is rendered hard by rapid cooling from this point—no water or oil quench is used. Contrary to usual procedure the hardest and most brittle case results from the low temperature quench, and the softer but tougher case results from a quench from a temperature close to critical.

"A variety of parts such as thrust washers, retainer rings and lock nuts are being treated in this way. By quenching on a core that is tough and resilient a hard case is formed without distortion."

Use of Continuous Heat Treat Units To Be Expanded

Willard Roth, engineer, Industrial Heating section Transportation & Generator division Westinghouse Electric Corp., Meadville, Pa.: "The past year has been one of transition in which engineers have had a chance to take stock of the many technical gains made during the war and to pick up the threads of those developments which were held in abeyance. During this period, there have been no sensational developments but rather a progressive refinement of equipment and methods to meet peacetime conditions in which operating cost is again a prime factor.

"Interest in automatic handling in continuous units has been intensified by the current high labor costs. For instance, continuous hardening and drawing units, in which the parts are automatically carried through the hardening furnace, quench, degreaser, and drawing furnace, are used wherever possible. In such units, the time temperature cycle in the furnaces and in the quench are all automatically controlled. The atmosphere in the hardening furnace, and in some cases the drawing furnace, is also automatically controlled so there is no decarburization or oxidation.

"One phase of the accelerated war research which offers possibilities in furnace construction is the development of high strength high temperature alloys. Some of these alloys may make possible furnace parts with higher working stresses. However, further work appears to be necessary in order to extend current knowledge of the behavior of these new alloys under all conditions.

"Refinements are constantly being made in furnace atmosphere generating equipment that mean greater ease of operation while automatically maintaining percentages of combustibles or per-

centage of carburizing components. An item that has made one of these refinements necessary is the day-to-day variation in composition of fuel gases which would tend to cause variation in the reacted gases comprising furnace atmospheres.

"Recarburization of decarburized stock is rapidly progressing from the experimental stage to the established commercial process. Since recarburization is sometimes effected during the normal annealing process, with consequent substantial savings in metal and machining costs, it seems reasonable to expect further rapid progress along this line."

Heat-Treat Forming Development Expands Use of Beryllium Copper

Harold G. Williams, chief metallurgist, Instrument Specialties Co. Inc., Little Falls, N. J.: "During the past year the technique of using beryllium copper, as developed in the war years for specialized applications, was refined to the point where it is used to produce components finding ready acceptance in the electronic, household appliance and industrial control industries.

"Outstanding feature of this development is the use of fixture heat-treatment to produce commercial parts to higher uniformity and precision. Beryllium copper gains its spring temper by a hardening heat-treatment applied after forming This allows parts to be formed while the alloy is in a soft, ductile state, which makes possible the production of units that are more complex in shape than those made from conventional spring materials. A wide range of temperatures may be used for the heat-treatment. Selection of the proper heat-treating temperature makes it possible to completely stress relieve parts simultaneously with hardening. By holding them in a suitable fixture during this operation, the pieces will conform to the contour of the fixture.

"The dimensional uniformity thus attained gives an opportunity to reduce the assembly cost of mass produced components by eliminating hand adjusting and calibration. The savings are often many times the cost of using the premium-priced beryllium copper alloy.

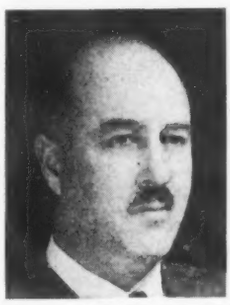
"Several subsidiary benefits are also realized by this process: The high temperature used for hardening, which is necessary to gain conformity to the fixture, results in springs having a higher stability because of freedom from residual stress. Recent studies show that higher temperature heat-treatment results in improvement in the endurance limit of beryllium copper by about 20 per cent.

"Because final shape is determined by the heat-treating fixture, the problem of spring back in press forming is eliminated. This simplifies tooling and reduces die adjustment and set-up costs. Parts made from thin gage material, ordinarily extremely difficult or impossible to form accurately on the punch press, can be readily produced with heat-treat fixtures to correct the wide variations caused by spring back. In some cases the forming may be done entirely by heat-treatment, eliminating the conventional forming tool. Special shapes, particularly circular parts not readily produced by tooling, can be easily made by heat-treating on mandrels or simple forms.

"The metallurgical control necessary in selecting the correct heat-treatment to gain the desired conformity with the proper combination of physical properties results in raising the general quality level of parts produced.

"This technique of heat-treat forming is not limited in application to beryllium copper. It can be applied to any age hardenable alloy where the heat-treating temperature can be raised to the point wherein stress relief is attained during hardening. It has been successfully applied to Z nickel, Ni Span C and some steels. Significance of this method of production lies in producing parts of sufficient uniformity that assembly problems are simplified. The increase in cost of the precision part is more than offset by the saving in assembly time."

Flame Hardening Increases Fatigue Resistance of Parts



H. V. Inskeep, development engineer, the Linde Air Products Co., New York: "The art and practice of flame-hardening was perfected and expanded to a great extent during the war. Many combat weapons had an increased life of usefulness because critical wear and bearing surfaces were hardened. In addition to improving the product, production was increased because of the inherent speed and simplicity of flame-hardening. The shortage of materials for heavy heating equipment was often the cause of long delays in the heat-treating of necessary and urgently needed parts.

"In many instances flame-hardening was an important factor in increasing heat-treating capacity as the equipment and fuel gases for this process were more readily obtainable. Many lessons on procedure and apparatus design were learned, and improved equipment and operation techniques are now available for increased civilian production. The flame-hardening process can be used to increase the fatigue resistance of a steel part having fillets or notches as stress raisers. Flame-hardening in the fillet or notch will strengthen the part at these points to a considerable degree. Flame-strengthening is the term applied to this operation."

Equipment Available for Heat Treating High Temperature Alloy

C. L. Ipsen, industrial heating division, General Electric Co., Schenectady, N. Y.: "The new high-temperature, high-strength alloy for gas turbine buckets, S-816 presents some interesting problems in heating for forging and heat treatment. High temperatures, up to 2300° F, are required for these operations, with a protective atmosphere that will prevent scaling and carburization. The S-816 alloy is exceedingly susceptible to carburization. The furnace selected for this application is a rotary hearth electric furnace heated by molybdenum resistors. Such a furnace is capable of continuous operation at temperatures in excess of 2500° F.

"While dry hydrogen would provide a satisfactory protective atmosphere, its high cost precludes its use. The atmosphere problem was solved by the use of a Neutrolene producer (atmosphere gas generator and carbon dioxide remover combined) and an ammonia dissociator. The former generates nitrogen with readily controllable amounts of carbon monoxide and hydrogen and the latter a gas of 75 per cent hydrogen, 25 per cent nitrogen. A proper admixture of these two gases gives the ideal protective gas, 80 per cent nitrogen, 19 per cent hydrogen, and 1 per cent carbon monoxide for forging and heat treating S-816, alloy.

"This is typical of the tailor-made gases that are now available for pre-

cision heat treatment. As another example, in carbon restoration, the Neutrolene producer can readily be adjusted to supply a gas that, with proper admixtures of methane and water, can restore or maintain surface carbon over the whole range of carbon and alloy steels.

"Another development of current interest is isothermal heat treatment to increase machinability. A roller-hearth furnace arranged for high speed automatic transfer of parts from the heating chamber to the quick-cooling chamber and subsequent transfer to the holding chamber appears to afford the ideal solution to this operation.

"Adequate and readily controllable furnace atmospheres and isothermal heat treatment are new tools available to industry for the continued march toward better and lower-cost products."

Applications of Gas Fuels Add New Heat Treating Data

Frederic O. Hess, president, Selas Corp. of America, Philadelphia: "In the use of gas fuels for high-speed heating and heat-treating of metals, the past year has added important data from numerous and varied installations. Applications have ranged from localized treating or through heating of relatively small repetitive parts to the heating or treating of large masses of metal as in bars or tubes. The importance of the data is not only in verifying anticipated results, foreseen from earlier developments, but in modifying accepted concepts, particularly in the heating of large masses, as to the length of time required to produce very accurately certain specified metallurgical changes.

"With steel bars and tubes, carbon or alloy heating rates of 2 to 4 min per in. of thickness have been established in contrast with conventional practices based on 1 in. per hour. The rates are achieved by utilizing high-speed gas combustion which produces heat that is in large measure radiant. Temperatures are well above those to which the work is to be brought, a factor which with the radiant character of the heat accounts for rapid transfer. The method discloses less tendency to scaling, decarburization, grain growth and distortion.

"In bringing 18-8 stainless steel to 2000° F in 2 min, the metal passes so fast through the critical range of carbide precipitation that the carbides remain in solution. Stainless tubes in 'as drawn' condition, with grain boundaries obliterated, show after annealing with a heating cycle of 51 sec., a structure with uniform grain size and no boundary precipitation. Carbon bars, 1 3/16-in. in diameter are hardened or tempered in 2 min 10 sec, as compared with conventional hardening time of 2 hours.

"The speed with which the heating is done permits the heat-processing to be integrated in mill schedules. Heating chambers with quench arranged as part of the heat-treating equipment are compact and, when desired, are located in line between mill stands or benches. Control of temperature and time is automatic and accurate. The data indicate that with radiant gas firing most metals can be successfully heated and heat-treated, on much faster schedules than have been conventionally utilized.

"In the use of gas for high-speed localized treating and thorough heating of relatively small parts, new data are concerned principally with variety of applications in which very short heating cycles are employed in automatic heating and heat-treating machines. Processing includes soft soldering, silver soldering, hardening, hardening combined with drawing, annealing and heating of billets or bar ends for forging.

"The heating principle is that of producing fast rates of heat transfer by exposing work pieces to high-temperature heat sources. Heat is generated in ceramic burners especially developed for rapid heating purposes. The calorific value of the fuel at the source of supply is reliably constant and the ratio of air to gas is kept under exact control. High temperatures accurately produced in this manner require only well-known practices in machine design to provide rapid, automatic processing in which the work is conveyed or indexed on accurate time cycles.

"Some examples of high heating rates possible are: The top ¼-in. of a 1-in. steel bar is flame-hardened at the rate of one piece every 55 sec. Here the heat transfer rate is such that the bar would be melted if exposed to the flame for 2 min. Stainless steel tubing of 1/16-in. wall thickness is annealed in 12 sec. A welded section in tubing ⅛-in. thick is annealed in 10 sec in such a manner that it is difficult to detect any metallurgical difference between weld and parent metal.

"Round copper slugs ½ in. in diameter by ½-in. long are annealed before extrusion into auto radiator tubes 2 ft long. The temperature of the heating tunnel is maintained above the melting point of copper, but the slugs are conveyed through it in tandem rows at a satisfactory annealing speed.

"Automatic gas heating is now successfully applied in production to parts weighing as little as a few ounces up to 56 lb. Work-carrying drums, dials or conveyors rotate continuously or intermittently as required and speed can be changed at will. One machine can be designed to heat or treat a variety of parts.

"Metallurgical structures obtained at the high temperatures involved are equivalent to those obtained from longer heating times at lower temperatures. In localized treatment, as in surface hardening of parts, more gradual, fracture-resisting zones of transition are produced.

"The examples cited, both for large masses of metal and for small, high-production parts, are but representative of data now available."

Cycle Annealing and Gas Carburizing Gain in Popularity

T. A. Frischman, chief metallurgist, Axle Division, Eaton Mfg. Co., Cleveland: "The ending of the war once again made available the higher alloy steels required for various heavy duty applications. Some of the former users returned to the use of high alloys as quickly as they became available whereas others are retaining the leaner war time alloys because of their lower initial cost and better machinability.

"Cycle annealing to condition the steel for good machinability and reduce furnace time continues to gain in popularity, particularly where large scale machining operations are involved. While this operation has hitherto been carried out in the open-fired large continuous type furnaces, it is now possible to procure such equipment with controlled atmospheres whereby annealing scale can be eliminated.

"Gas carburizing likewise continues to gain in favor of pot carburizing, especially where large volume of work of similar size characteristics are involved. The operation of carburizing without the formation of soot is now an estab-

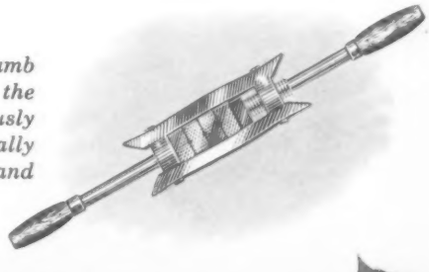
Metal Worker...in 1872

The town blacksmith was the leading metal-worker in 1872, the year GTD "Greenfield" was born. And a mighty man he had to be in order to worry a thread onto a piece of metal with that primitive threading tool—a "jamb plate" *. Working to tolerances of perhaps a sixty-fourth of an inch, the metal-worker of 1872 would be amazed at the accuracy of modern "Greenfield" threading tools, measured in ten thousandths of an inch.

The history of the Greenfield Tap and Die Corporation during the past 75 years has been the history of the development of ever finer and more accurate threading tools to serve industry.

GTD Greenfield 75th YEAR

Forerunner of modern threading tools, the "jamb plate" was a crude vise-like tool that clamped onto the piece of metal to be threaded. It was then laboriously twisted back and forth until a thread was actually "jammed" onto the metal. It was slow, hard work and the results were haphazard.



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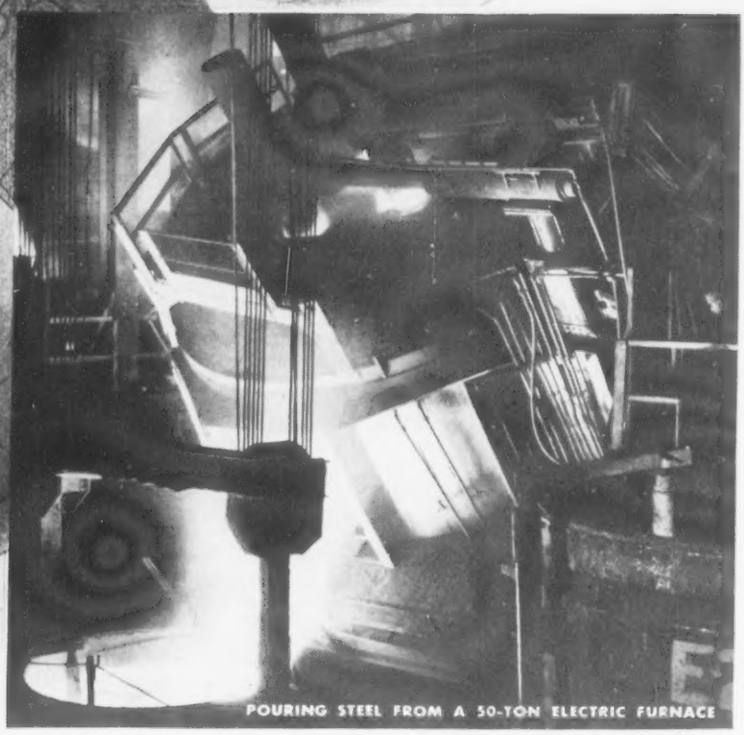

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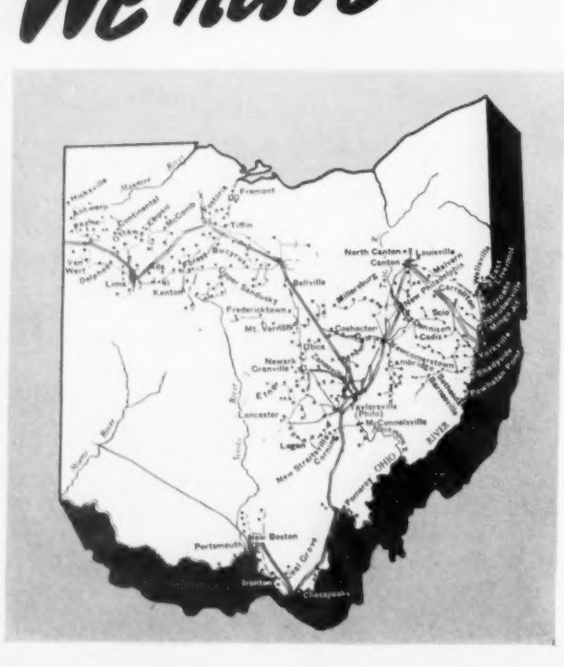

INDUSTRIALISTS whose postwar plans include the use of steel will find an abundant supply in the area served by The Ohio Power Company. This area ranks first in world production of electric steel. The State of Ohio ranks second in the Nation in the production of all steels and leads all other states in certain trades allied with steel — they include bearings, forgings, bolts and nuts, stamped and pressed metal parts.

This part of Ohio has the advantage of plentiful natural resources including coal, oil, natural gas, salt, brines, limestone, dolomites and clays, It has a magnificent transportation system, proximity to the world's greatest markets and low-cost power from mine-mouth plants.

The Ohio Power Company serves 555 friendly Ohio communities. We know them intimately and are in a peculiarly good position to advise producers in selecting the ideal location within the area. Confidential inquiries will be welcomed by our Industrial Agent.

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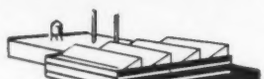
MANUFACTURING

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lished procedure in furnaces of the continuous type producing upwards of 800 to 1000 lb per hour of deep case work.

"The versatile molten salt bath furnaces continue to find new uses productionwise, particularly those involving brazing and the different types of interrupted quenching heat treatments. Paralleling these advances are those of the induction heating field where the activities have been expanded not only to the field of metalworking but to other materials as well. As the number of applications from this type of equipment continues to grow, it appears at the moment that the possibilities of induction heating are unlimited. Judging from the amount of effort that is being put forth in the research and development of this method of heating, this thought might be more fact than conjecture."

New Heat Treating Salts Automatically Rectified

D. J. Richards, vice president, sales, E. F. Houghton & Co., Philadelphia: "One of the major problems in salt bath treatment was the maintaining of a neutral bath in a non-decarburizing condition. Although a particular bath would be in a neutral condition when first started, it would eventually pick up sufficient metallic oxides from the pot or work and oxygen from the air to cause pitting or decarburization of the work.

"This could be controlled by the very careful addition of various rectifying agents such as borax or boric acid. However, this practice was not satisfactory in many installations. There was a tendency on the part of the operators either to wait until the bath was in a badly unbalanced condition before rectifier was added or to add excessive amounts which led to attacks either upon the work or upon the pot and to difficulties in cleaning.

"A new type salt was developed to eliminate the above difficulties. This bath automatically rectifies itself and remains in a neutral and nondecarburizing condition for indefinite periods. This product contains an organic inhibitor which reacts with the decarburizing alkalinity as it develops in the bath and then the reaction products volatilize off into the air. This bath also has another distinct advantage—bright work. Parts coming out of the bath are practically as bright and clean and as free from surface discoloration as when they entered the pot.

"In line with our thoughts on the automatic rectification of neutral baths, we pioneered the use of immersed graphite rods for the rectification of high speed steel salt baths. The majority of the high speed steel baths in operation are now equipped with graphite rod rectification.

"The outstanding feature of liquid heat quench is its ability to withstand up to 10 per cent contamination with barium chloride without any increase in its melting point of 875° F. or any change in its fluidity or quenching rate. The lower melting point and wider working range has also permitted the use of a lower quenching temperature which is desirable for certain of the high speed steels.

"The use of a new type salt has eliminated the necessity of replacing the quench bath at frequent intervals. In most installations these baths operate with only the normal additions required to compensate for drag-out losses and are only discarded when the preheat and high temperature baths are dumped according to regular schedule."

Welding Stresses Reduced by Low Temperature Treatment

T. W. Greene, engineer, The Linde Air Products Co., New York: "Following extensive investigation and research, a new method of stress relieving has been developed, and during the last year has started to be applied in the field to large welded structures. This method is rather unique and has been designated as controlled low-temperature stress relieving because the stress relieving is done at temperatures of approximately 350° F.

"Fabricators and engineers have recognized that high residual stresses of near yield point value are developed in the weld metal under all conventional methods of welding and that these stresses are particularly pronounced in the direction parallel to the weld length. For this reason stress relieving has been generally accepted to eliminate or reduce these stresses on fabrication such as boiler drums and pressure vessels.

"Conventional procedure consisted of evenly heating the entire structure or section in a furnace to a temperature of 1100° to 1200° F. This method is effective, yet it is also very expensive and, requiring large furnaces, cannot be applied to very large structures such as ships, large storage tanks, and similar applications.

"With the low-temperature process, stress relieving is accomplished progressively by controlled heating and co-ordinated cooling of the metal adjacent to the weld, taking advantage of the high value of stresses present in the weld. The applied treatment temporarily stretches the weld to an amount that corresponds to yield point strain, and in effect proof-tests the joint. This straining of the weld, which is already under near yield point stress, causes the weld to yield slightly and effects the desired adjustment to reduce the stresses when the temporary thermal loading is relaxed. There is no distortion or deformation of the structure and the reduction of residual stresses is practically as effective as furnace stress relieving.

"Oxyacetylene heating equipment of special design is used. The maximum temperature to which the steel is heated is about 350° F (300° F for stainless steel). The heating must be properly spaced on each side of the weld; it must be of correct width and intensity and must be followed up by proper cooling.

"For optimum results, all these factors have been established by careful experiments and study in laboratory and field on steel with thicknesses of ½-in. to 2 in. For thicknesses less than 1½-in., the plate is heated only from one side. For thickness more than this, both sides are treated simultaneously. To date, low-temperature stress relieving has been applied only to the simpler welded joints of butts, fillets, and tees. The process might not be fully effective on complex reinforced assemblies, yet it may answer many needs and serve as a supplementary and alternative method to the more expensive high-temperature furnace stress relieving practice.

"Controlled low-temperature stress relieving has been applied to a number of large ocean-going tank steamers—sometimes during construction and sometimes during repair in dry dock—years after completion of the ship. All the important butt welds of deck, shell, bottom, and bilges were treated. The process also has been applied to large penstocks, field-erected tanks, and pressure vessels. It has been used on medium-thick stainless steel pressure vessels and in connection with repair work on existing tanks. As knowledge of the process becomes more general it is expected that other applications will develop, not only on the welded constructions of the types

mentioned, but also on welded structures and tie-in assembly welds that are impossible or impractical to stress-relieve in a furnace."

Broader Knowledge of Induction Heating Increases Its Utility

T. H. Gray, research engineer, research laboratories, the Westinghouse Electric Corp., East Pittsburgh, Pa.: "During the past year advances were made in induction heating practice that proved of economic importance to the metalworking industry. In particular, the superficial hardening of steel parts by induction heating successfully replaced carburizing processes for a number of applications.

"Induction heating at frequencies in the neighborhood of 450,000 cycles was applied successfully to the case hardening of the SAE type of carbon steels, particularly to SAE 1045 and 1050 steels. Wrist pins of SAE 1050 steel were hardened to surface hardness of 60 to 64 Rc at rates up to 1200 pins per hour, and with uniform case depths of 0.020 to 0.030-in.

"During the past year the process of contour-hardening both fine and coarse toothed gears by high-frequency heating was successfully developed. Success in contour-hardening fine toothed gears required careful adjustment of several factors, namely, short accurately-timed heating cycles of less than 2 sec duration; preheat treaments; frequency and power inputs of the order of 10 per square inch. Fine-toothed gears previously thought to be out of the range of contour-hardening by induction heating were so hardened that laboratory and service tests show them to be comparable in performance to the best carburized gears.

"Results of studies on microstructures produced by the use of extremely short heating times in induction heating practice also emphasized the influence of prior structure on the microstructure of the hardened case. The presence of spherodized carbides and large ferrite grains in the initial structure has been shown to be detrimental to the production of fully and uniformly hardened cases due to the structure-sensitivity of the austenitization process. Many previously reported studies indicated that rate of austenite formation is dependent on the number, size, and dispersion of the carbide particles, and on the length of the path through the ferrite grains traversed by the carbon atoms. As the scope of induction hardening practice becomes wider, more and more importance will be attached to the microstructure of the steel prior to treatment, particularly when heating periods shorter than 1 sec are employed. Also, it is expected that steel suppliers will be called upon to meet increasingly rigid specifications as to the microstructures of steels destined for induction hardening applications."

General Improvements Lead to Accuracy in Heat Treating

Haig Solakian, vice president, A. F. Holden Co., New Haven, Conn.: "In the heat-treatment of metals there is now a better and a more general understanding of the special practices known as mar-tempering and austempering. These techniques have passed beyond the experimental or curiosity stage, and are now frequently utilized in heat-treating shops to great advantage. Intricate shaped tools and dies can now be heat-treated with minimum distortion and no cracking.

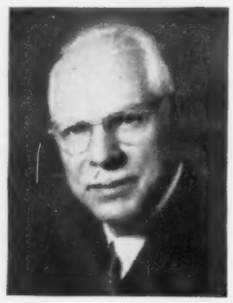
"The number of parts, or assemblies, silver or copper brazed has increased considerably. The use of molten salt bath as a heating medium for this purpose has become quite popular. This medium eliminates the necessity of maintaining protective atmospheres and also does away with flux for the copper brazing. Furthermore, brazing, silver or copper, is generally accomplished in a shorter time.

"Normally the annealing of stainless steel requires two distinct operations—annealing and descaling. Now these operations are carried out simultaneously by the use of a specially designed molten salt bath. By utilizing such a bath, operating say at 1850° F, not only is the stainless steel heated to the desired temperature without any further oxidation, but whatever initial scale may be on it, is removed during the heating and quenching period. This effects appreciable savings in the treatment of such metals.

"There have been further improvements and developments in the automatic handling or conveyor mechanisms for the large production heat-treating of parts, large or small. Manufacturers are considering installing more such equipment where production parts, uniform or identical in shape or size, lend themselves to this type of handling.

"A noted improvement also has been made in the design and building of ceramic pots used for temperatures of 1750-2350° F. The life of such pots has increased from approximately six months to a year or more. They have eliminated the headaches involved in the repeated metal pot failures at elevated temperatures. All the above improvements are not phenomenal; they are rather a result of gradual progress. However, they have enabled the man handling metals to treat them, whatever the heat-treatment, more accurately, conveniently and economically."

Technical Progress Needs Balance Between Men and Machines



George T. Trundle, president, Trundle Engineering Co., Cleveland: "Technical progress in metalworking has been excellent and bids fair to be more remarkable in the future; however, American industry is apparently unable to take full advantage of this progress. For some reason, the theoretical rate of improvement seldom seems to be arrived at in actual practice. Why?

"The answer, I think, lies to a large extent in the fact that management has failed to realize that it takes a balanced team to pull a load. In metalworking, a typical production unit consists of a man and a machine. They are a team. Neither one is any good without the other. Together they can do wonders—if they pull together.

"But what happens when the driver tries to make one horse pull too much of the load? The answer is, 'it can't be done that way.' The pulling power of both horses has to be balanced. And until American industry can get the producing power and willingness of the operator in balance with the production capacity of the machine, technical progress in metalworking will not be translated into a full measure of satisfactory results.

"What we need is more 'technical progress' in inspiring the men who work in metal to get the full measure of productivity out of the machines with which they work."

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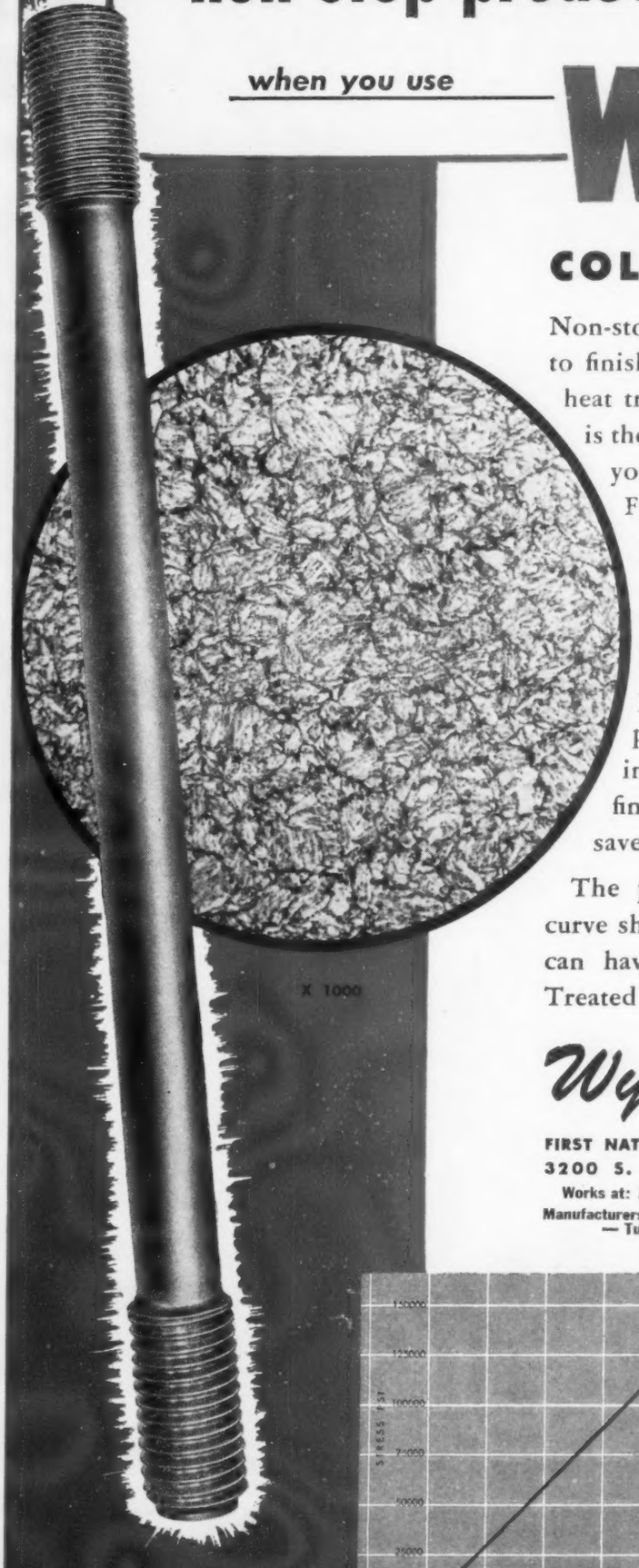

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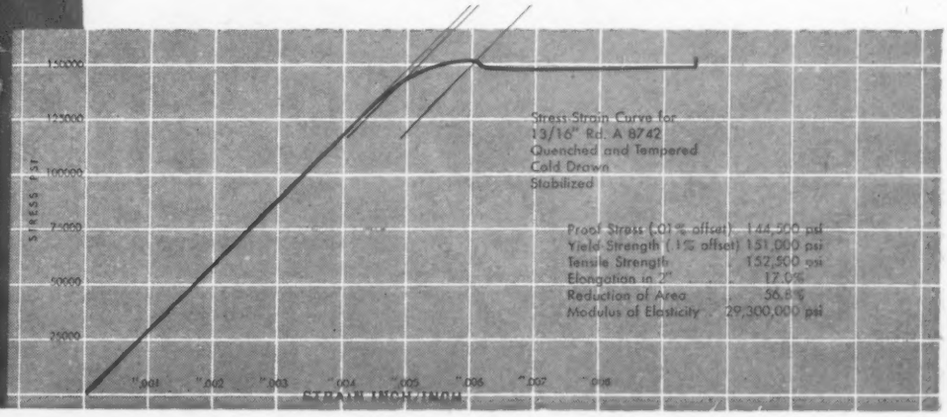

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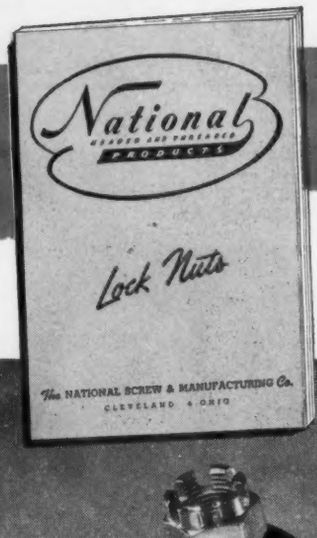

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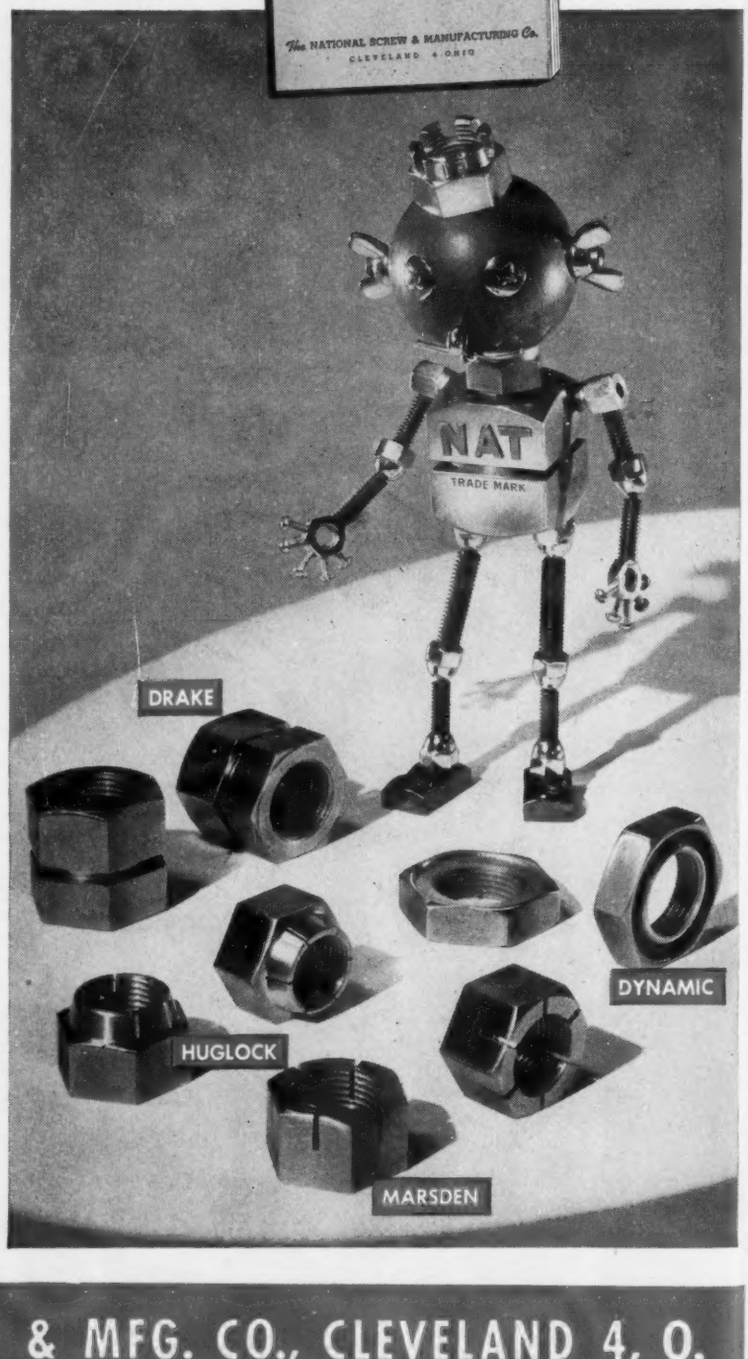

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Surface Treatment

Metallizing accepted as design and production method . . . Couple rustproofing with color treatment . . . Fine size electric furnace abrasive in heavy demand . . . Continuous spray cleaning a significant development . . . Oxide-coated aluminum products popular in construction field

Metallizing Now Accepted as Design and Production Tool

W. C. Reid, vice president, Metallizing Engineering Co. Inc., Long Island City, N. Y.: "The transition of the metallizing process from the repair shop to the production line has progressed so rapidly, that already drastic changes have been made in both equipment and technique.

"The conventional metallizing gun built for intermittent use as a hand tool has already given way to heavy-duty equipment designed for mechanical or semimechanical mounting, capable of handling 3/16-in. dia. wire, and equipped with automatic speed control, force feed lubrication and many other refinements.

"The metallizing machine of today can be seen applying aluminum to cloth for condensers—stainless steel to turbine shafts—zinc to commercial and home refrigerator units — copper to carbon brushes and resistors—high carbon steel as wear resistant surface to aluminum and magnesium castings—copper to glass for soldering—copper to assembly components for furnace brazing—zinc and aluminum to many nuts, nails, screws and washers for corrosion resistance — various metals to wood, plaster, pressed wood, plastics, stone, and paper for decorative effects or electrical conductivity —aluminum to plate glass as heating elements on infraelectric heaters—copper to the bottom of pressed steel cooking utensils—zinc and aluminum to boat hulls and structural steel for corrosion resistance or as a bond for paint or plastic coatings—and brass to the steel toe cap in safety shoes to prevent sparking. A representative selection of applications such as this, which are already proved on a production line basis, clearly shows not only the trend, but a wide acceptance of the process as a design and production tool. It already has begun to point the way toward highly specialized machines designed and built for a specific purpose, capable of sustained operation under most exacting production line requirements, and which will be automatic to such an extent that operator attention will be reduced to minimum.

"Much has already been done toward this end—machines have been designed to spray only one metal at the greatest possible speed and lowest cost. Several such machines have been mounted on an automatic machine so that one operator could handle them all. Hence there seems to be little doubt but that future production requirements will be anticipated by corresponding improvements in metallizing equipment and technique."

Few If Any Major Changes Expected in Electroplating

Henry Strow, chief chemist, MacDermid Inc., Waterbury, Conn.: "Progress in the electroplating field has taken about the course that any informed person would have predicted in the closing year of the war. The processes used generally are the same as those used in the years prior to the war for the same type of work. Decorative finishes are of major consideration and here again, the practice is much the same as that before the war.

"Improvements in most processes in use before the war have been made but the improvement is one of degree only, and not so much revolutionary changes. Great emphasis has been put, and is being put on equipment to do this type of work. High cost and reduced productivity of the labor has necessitated large initial investments for machines to replace skilled labor. Owing to the improvement in this equipment, many things which had been done only on a limited scale or for special applications prior to the war are now being done commercially in large production. Such things as copper, nickel and chromium plating in a single full automatic is common practice today, while this practice, before the war, had been viewed with a great deal of concern by all vendors of equipment and supplies owing to the possible contamination of the solutions in the various cycles. Bulk plating of nickel has become a much more highly specialized art and considerably heavier deposits are the rule today. This is a direct result of both improvement of the solutions used and the equipment.

"Bulk plating of chromium is being done on a limited scale and appears likely to be much more widespread within a comparatively short time.

"Wartime specifications have been largely abandoned as the domestic production requires a different type of protection. Shortages of material are forcing many changes in techniques and metals used, and will probably continue to plague the industry for some time to come.

"Major changes in the electroplating industry probably will not occur within the next year, although some specifications for plating work may be considerably revised as additional information becomes available on corrosion resistance."

Judicious Use Determines Performance of Metal Coatings

George Diehlman, Research Laboratories, National Lead Co., Brooklyn, N. Y.: "Of recent years a wide variety of synthetic resins has been developed and used in the formulation of protective coatings. These possess many special properties and by their judicious use, and with due consideration for environment and surface condition of the metal, a satisfactory coating composition can usually be provided. Alkyds, phenolics, cumarone-indenes and modifications of these as well as various other resins, and chlorinated rubber are typical of the new products available. Vehicles made with these materials are successfully used with red lead to provide fast drying metal protective requirements. Primers made entirely with synthetic resin type vehicles

perform best on steel surfaces which have been completely cleaned.

"The best know primers with the longest record of performance are composed of red lead and linseed oil. They are still widely specified simply because they provide the most reliable protective coatings over the diversity of surface conditions which are encountered on structural steel. Red lead-linseed oil primers are noted not only for their corrosion inhibitive qualities but also for their ability to adhere, particularly on steel surfaces which have not been completely cleaned. This latter property is primarily attributable to the linseed oil which is known to be an excellent wetter of steel surfaces."

Interest in Oxide-Coated Aluminum Products High

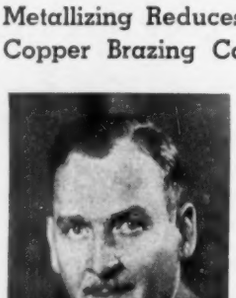
F. Keller, chief, Metallography Division, Aluminum Co. of America, Aluminum Research Laboratories, New Kensington, Pa.: "In the first postwar year, industry has recognized the advantages of aluminum and will use it in many new applications. For many of the articles that will be made, the general trend is to apply surface finishes to increase sales appeal and to provide protection where needed. Thus, many of the finishing processes which were developed and improved under the stimulus of war are now finding increased application for peacetime uses.

"Still foremost among the finishes for aluminum alloy products is the process for forming oxide coatings. There is considerable interest in oxide-coated aluminum products for architectural applications where long life, good appearance and ease of maintenance are prime factors. In development is an aluminum alloy—oxide-coated product combined for exterior architectural use.

"This coated product has a natural slate-gray colored oxide coating that will blend well with stone work and other building features. Recent developments on colored oxide coatings made by chemical treatments are under active consideration for many applications where the decorative and colored effects obtained with these coatings add considerable eye appeal.

"To the public, chromium plate is the accepted finish for some articles. Now that some of these articles formerly made from other metals are being made of aluminum, there is active interest in the methods available for plating aluminum with chromium. Although several methods for plating are available, the one that appears most successful and that is being generally recommended is the zinc immersion process. At present, the employment of aluminum alloys for automobile bumpers, radiator grilles, hardware and many other articles finished by chromium plating is under consideration."

Metallizing Reduces Copper Brazing Costs



L. E. Kunkler, president, Metallizing Co. of America, Chicago: "Within the past 1½ years the metallizing field has again been broadened by a rather unique application in the stamping industry and also other industries where it has been necessary to join steel parts together in a rapid and economical way.

"Prior to the entry of metallizing into the field, pieces of copper wire have been placed at the joint and the entire piece then passed through a reducing furnace. In many designs the forming and the placing of the copper wire at the joint was an extremely lengthy process, and hence, a costly one. In addition to this, it was almost impossible in some designs not to have an excess of copper in spots, after the piece had gone through the furnace.

"With the use of metallizing it is possible economically to apply the desired amount of copper at the required spots. At the present time one installation is using 18 modern metallzing units in a continual spraying operation. By applying the metal this way it is possible to have sufficient copper at hundreds of joints in less than a minute. All of these joints, when passed through the furnace, are thoroughly copper brazed and have a tensile strength of approximately 60,000 psi. It is interesting to note in this one application that there is no preparation of the surface, other than degreasing. The entire setup is on a conveyor system in which the article placed at one end goes through the degreasing bath, past the metallizing guns and then into the furnace.

"In all of the above, special metallizing racks were used, as well as special metallizing wire reel stands that were basically designed by the manufacturer of the metallizing units. These particular applications reduced the manufacturing costs of the units by 50 per cent. The finished product was far superior to that which could have been obtained by the old hand operation."

Antirusts and Paper Protect Highly Finished Steel Parts

T. L. Counihan, chief metallurgist, Hyatt Bearings Div., General Motors Corp., Harrison, N. J.: "The prevention of corrosion on highly finished steel parts, such as found on ball and roller bearings, is an important item. It is accomplished by the use of proper antirusts and the correct selection of wrapping materials.

"Sometimes accelerated tests on antirusts and wrapping materials lead to erroneous conclusions. Such tests may tend to indicate materials to be safe to use which later will be found to be injurious to the metal. However, accelerated tests are helpful in screening out materials which will be shown to be obviously unsuitable to use.

"The reasons accelerated tests fail to value correctly the protective quality of an antirust or packaging material are several. Some antirusts slowly break down when in contact with metals for a prolonged period of time. In such cases the inhibitive effect is lessened; this will result in rusting or acidic products forming from the breakdown and may cause corrosion or stain. At times humidity tests or other tests in exposure cabinets, which are in reality accelerated tests, fail to forewarn of such breakdown.

"Antirusts which fully protected steel parts for more than 2 months in a test cabinet provided with an air flow at 120°F and 100 per cent relative humidity have allowed corrosion to appear on packaged steel articles under good interior storage conditions in 5 months.

"Particular care must be exercised in evaluating antirusts by humidity cabinet tests where a combination of metals such as brass and steel is used to form an assembly. The constant condensation and dripping of water from the parts coated with antirusts can leach out an electrolytic material which may be present as an active component of the antirust and indicate a very satisfactory protective condition to be present. In actual use, however, when the parts are packaged, this leaching out does not occur,

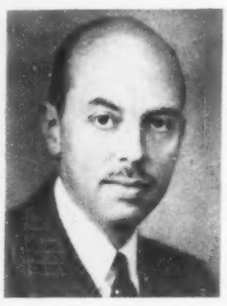
with the result that an electrolytic action may be set up between the dissimilar metals and staining may result.

"The second possible source of trouble in packaged parts is the wrapping paper itself. Generally papers are rated by their acid contents. Certainly a highly acidic paper is to be avoided, but the presence of electrolytes such as chlorides or the possibility of the presence of unsuitable plasticizers should not be overlooked.

"A paper with 0.02 per cent SO_3 is generally recognized as satisfactory, yet such a paper has been known to cause very severe corrosion on steel within 2 months due to the use of an improper plasticizer. Glycerine is used in some wrapping papers as a plasticizer, although it is hygroscopic and definitely unsuitable Other plasticizers and grease-proofing materials used in wrapping paper can and do break down and provoke corrosion in the presence of metals.

"Consequently, it is well first to screen out undesirable antirusts by tests in exposure cabinets and to examine wrapping conductivity tests for electrolytes. With the completion of these tests the evaluation of the antirust and paper is but partly completed, for such tests will not allow for antirust breakdown on aging or determine if troubles may be encountered because of hygroscopic or unstable plasticizers or grease-proof coatings."

X-Ray Shields and New Alloy Coatings Mark Lead Progress



Felix Wormser, secretary and treasurer, Lead Industries Association, New York.: "There have been no really new applications for lead known to me during 1946. Indeed, it has been difficult and, in fact, impossible to satisfy the known uses for the metal as the demand for lead continues at a high rate, being well over 1,000,000 tons per annum, with a visible supply of only 800,000 tons.

"In the field of protective shielding against rays, there is probably nothing new technologically, although further studies, such as those by Singer of the National Bureau of Standards, have given a better understanding of the amount of protection required under various conditions. The use of lead for this purpose is, of course, expanding tremendously with the commercial marketing of the betatron and developments in atomic fission. What future demands will be placed on lead for these uses can only be guessed at now.

"Furthermore, in the field of lead alloy coatings, there have been improvements in the process which result in a superior product, and, consequently, several new commercial plants to apply lead alloy coatings have been put in operation recently.

"In the building construction industry, an old use of lead came to the fore in 1946 in a somewhat new manner. It is the use of lead for the 4 in. soil stack formerly made of rigid pipe. This enabled the plumbing industry to develop 'unit plumbing' which makes it possible for the plumber economically to fabricate in the plumbing shop an entire unit of soil and waste pipe for a bathroom, all the piping being lead, instead of assembling all the elements of such a unit in place."

Failure of Galvanized Tanks Blamed on Small Capacities

Wallace G. Imhoff, president, Wallace G. Imhoff Co., Los Angeles, Calif.: "The year 1946 was marked by some very live problems in the hot dip galvanizing industry. These included the high rate of failures of galvanized hot water heater tanks, the use of lead in the hot dip galvanizing bath, and the continued progress in the introduction of the hot air dryer to replace the old type hot plate dryer.

"Too small a tank capacity, under 30-gal, with violent, constant firing was cited as the chief cause of early hot water tank failure. One of the important causes of zinc coating troubles has been found to be due to hot dip galvanizing baths with no lead content. The galvanizing industry, at least in one plant, doubled production and improved the quality of the product, at the same time lowering costs by replacing their old type hot plate dryer with the new type hot air dryer.

"New things ahead for 1947 indicate further expansion of the hot air dryers to replace the old type plate dryers; suggestion that a lower limit as well as an upper limit be set for lead in the hot dip galvanizing bath. Already the Southern California Gas Co. has sponsored a very extensive advertising campaign showing the smallest galvanized hot water heater tank should be a 30-gal tank. With millions of new homes to be built all over the United States, it is a most important must that no 20-gal tanks be used. Premature failures can be greatly reduced if only 30-gal tanks and larger are used."

Rustproofing and Color Treatment Are Combined

George H. Pimbley, vice president and director of research, International Rustproof Corp., Cleveland: "In the field of anti-corrosive processes and coatings for iron, steel, and zinc surfaces, the trend has been toward methods that couple improved rustproofing with color treatment, in one continuous series of operations.

"By previous conventional methods, phosphated objects had to be thoroughly dried before painting or oiling. Furthermore, it is impracticable to paint small threaded parts, such as nuts and bolts, because paint clogs the threads. Hence about the only possible protective treatment for such parts, after phosphating, has been oiling, which leaves much to be desired.

"To meet this situation the company developed new procedure and line of products, known as 'Irco-Seal', available in several colors and in metallic aluminum effect. The latter resembles cadmium plating in appearance, and is more durable under most kinds of service conditions.

"These products are exceedingly thin, fast drying liquids, having excellent penetrating characteristic, so that they impregnate and seal the porous zinc phosphate coating produced by means of the manufacturing process. Because it is an impregnating rather than a coating treatment, there is no appreciable added build-up; threads are not clogged, and there are no messy sags or drips. The binder constituent is a synthetic resin of heat setting type.

"The product tolerates contamination of up to 25 per cent water without detriment to its working or rust resistant values. Such water is eliminated smoothly and rapidly during the drying of the material. Therefore parts do not have to be thoroughly dried but can be immersed directly into the liquid after they are lifted out of the phosphating tank, with just a few moments of draining in between. The aluminum member of

the line has a characteristic medium metallic luster. The other colors are of uniform velvet-flat appearance.

"The operational schedule as a whole consists of cleaning off oils and dirt by alkaline or other suitable means, then immersing in hot dip bath for average time of 20 min.; immersing for a few moments in the impregnating liquid; then (as regards small parts handled en-masse) centrifuging or tumbling to eliminate excess liquid, to promote fast uniform drying and to avoid sticking. For a moderate degree of durability, represented by 50 to 100 hours salt spray test, this completes the schedule, achieving antirust protection and coloring in one series of fast simple operations.

"However, for really good durability, these operations should be followed by heat treatment to 'cure' the resin in the liquid, turning it into an insoluble, infusible type of resin.

"This method of phosphating and coloring is often of great advantage as an economical means of identification of various small parts going together in rapid assembly operations. It is primarily intended for small objects handled en-masse and by dipping; however it may often be used advantageously on larger phosphated surfaces by spray application to individual pieces."

Continuous Spray Cleaning and Pickling May Revise Practices

William W. Clarke, general manager, Metalwash Machinery Co., Irvington, N. J.: "One of the outstanding developments in the surface treatment of metals during the past year was the development of the continuous spray cleaning and pickling process for metal parts prior to porcelain enameling.

'For the first time in the history of the enameling industry, it is possible to place the ware on a conveyor in the fabricating department and deliver it to the ground coat spray booths, cleaned, pickled and nickel-coated, ready to receive the enamel—without any intermediate handling.

"The machinery which performs this cleaning and pickling task is a completely closed unit which can be placed anywhere in the plant without danger to adjacent equipment, even the fumes having been eliminated in the exhaust air from the spray compartments.

"The quality of the work is not left to the discretion of an operator. For any given setting of the machine, each piece of work is cleaned, etched, nickeled and dried with exact uniformity, and rejects from cleaning failures are virtually eliminated. As a result, a standard of cleaning has been attained that was unattainable with other types of equipment—manual or automatic.

"Because of the improved quality of cleaning, there has naturally been an improvement in the quality of bond or adherence between the enamel and steel. Test panels have shown an amazing uniformity in adherence over the entire piece as compared with panels processed by older methods."

Beneficial Chemical Reactions Occur in Paint Film as It Ages

E. J. Dunn Jr., Research Laboratories, the National Lead Co., New York: "One of the beneficial chemical reactions that is carried on in paint film as it ages and weathers might be termed a function of reactive pigments in the film.

"One of the more widely used paint vehicles is linseed oil which, spread as a thin film by itself, gives poor protection. Adding a completely non-reactive white or inert pigment might give protection for 18 months, but by adding the proper amount of reactive pigment to the formation, good protection may be obtained from 4 to 8 years in an atmospheric exposure.

"When a pigment reacts with the vehicle it forms what are known as soaps. Soap formations have been shown to exist in many forms, produced at varying rates and in varying amounts depending on the compound mixed with the vehicle.

"Yet not all compounds are capable of forming soaps. For instance, in metal protective paints and primers there is little tendency for aluminum flake or iron oxide to react with the vehicle, whereas red lead, basic lead chromate or zinc oxide will form soap readily. When the soap forms in the paint film, it is forming where it will produce the most good. As paint films age, the permeability to water decreases so that the formation of soap within the film may aid the further restriction of the passage of water.

"Our studies indicate the phenomenon of lead soap formations and the character of the particles produced thereby actually help to stabilize the paint system.

"The rate which the lead soaps are produced in the film is also a most fortunate phenomenon. The acidic decomposition products form in the film at a faster rate than the soap formations proceed, as the acid number of the films is never reduced to the acid number of the original paint. An acid number in the range of 70 to 90 is still prevalent in some films that have weathered 5 years at our Sayville Exposure Station.

"Without these beneficial chemical reactions, it appears paint films would be less durable. It is our experience that chemical activity has to be given consideration in formulating metal protective primers and paints for good durability and adhesion".

Fine Size Electric Furnace Abrasives in Heavy Demand

A. I. Sandorff, General Abrasive Co. Inc., Niagara Falls, N. Y.: "Abrasives made in the electric furnace, such as aluminum oxide and silicon carbide, are in greater demand for finishing operations than they were during the war years.

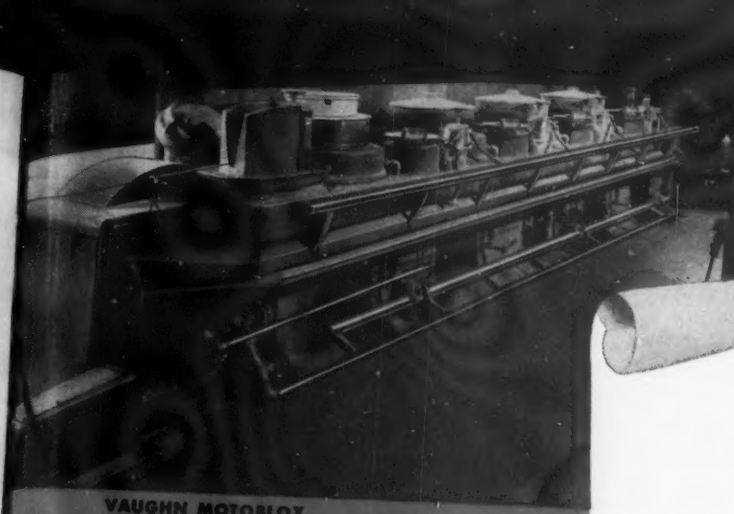
"The significant development over the past year is the heavy demand for medium and fine sizes which for years were considered surplus. Polishing operations now start with size 120 where formerly a size 60 might have been used for roughing. Greaseless compositions using aluminum oxide in sizes 180 and finer are in such heavy demand that abrasive grain manufacturers are hard pressed to supply the required grain.

"This trend toward finer sizes is apparent in all fields where electric furnace abrasives are used for grinding, polishing or buffing. It has necessitated radical changes in manufacturing processes in the plants of the abrasive industry. It has increased the costs of manufacture to the industry but the end result will be a healthy one as it will eliminate the necessity for refurnacing of fine sizes and dust collector fines and will give the industry a wider market which will use, in better proportions, all of the various sizes produced."

Study Relationship of Hydrogen To Enameling Characteristics

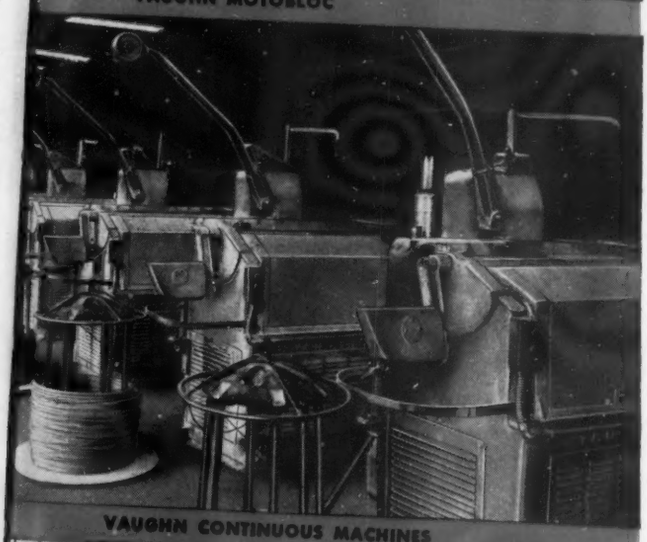
W. A. Deringer, metallurgist, A. O. Smith Corp., Milwaukee: "A common belief held in the enameling industry has been that pure ferrous iron, devoid of all metalloids and carbon, is the ideal base metal for commercial use. For enameling use, therefore, a rimming-type ingot iron of very low metalloid and carbon content has been made. This iron has been the base metal used for all enameled pressed steel appliances, plumbing fixtures, signs, and architectural ware. It has worked well enough, in general, as a base metal to enable the enameling industry to develop rapidly during the past 30 years.

"This rapid development, however,



VAUGHN MOTOBLOX

VAUGHN MOTOBLOC



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COMPLETE COLD DRAWING EQUIPMENT . . . Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys.

does not mean that there have been no difficult problems. Such defects as delayed fish scaling, "copperheading," poor adherance, reboiling and "jumpers" were continually causing trouble. Not until the role of hydrogen was disclosed did it become known that the character of the base metal had much to do with each of these defects.

"The experimental evidence gathered during an investigation of seven ferrous metals—SAE 1010 steel, C-0.13, Mn-0.42; a metal annealed in hydrogen; an enameling grade iron, C-0.04; a titanium-bearing enameling iron, C-0.04, Ti-0.44; a carburized metal, C-0.27; a chromium steel, C-0.06, Cr-5.0; and an 18-8 stainless steel, C-0.09—shows that there is a relationship between the hydrogen behavior and enameling characteristics of these metals.

"The relationship can best be explained on the basis of diffusibility of atomic hydrogen through these metals and is in no way affected by the total carbon content or by the stabilization of the carbon through the formation of carbides other than iron carbide. These added metallic elements may decrease the diffusibility of hydrogen through steel in two ways, namely: (1) They may have a poisoning or reverse catalytic effect on hydrogen diffusion, or (2) they may 'plug the gaps' in the crystal lattice and by so doing render the metal impenetrable to atomic hydrogen diffusion.

"The addition of small amounts of titanium to the base metal has recently been found to have a profound effect on the enameling behavior of sheet iron. The improvement effected by the use of titanium-bearing steel has been so pronounced that this new type enameling iron was placed on the market soon after its discoveries."

Finish Durability Increased by Advances in Surface Treatment

V. M. Darsey, president, Parker Rust-Proof Co., Detroit: "A recent Bonderizing development is the conversion of aluminum alloy surfaces to an insoluble crystalline phosphate coating which effectively increases adhesion and durability of applied paint finishes. Most aluminum used in industry consists of alloys varying in composition and corrosion resistance. Adhesion of paint to alloys such as 17S or 24S is quite different from its ahesion to 3S or 52S. Unless properly prepared, unsatisfactory paint performance is likely to result. Outdoor weathering tests, as well as accelerated salt spray and humidity tests, indicate that the conversion of aluminum surfaces to a phosphate coating by Bonderizing, not only improves paint performance, but permits the use of a wide variety of paints which cannot be used effectively over untreated aluminum. The process is applied by either spray or immersion methods and requires 1 to 2 min. for the coating formation. Since the process is fast and requires no electricity, it is readily adapted to conveyor production methods. Besides coating aluminum, it also coats zinc and steel and their alloys, a feature which is readily appreciated by manufacturers who have mixed production of these metals.

Use of Bonderite as an aid in drawing has increased extensively during the past year. Steel or aluminum surfaces are treated to convert them to a phosphate coating similar to that so widely used for corrosion resistance, the process being controlled so that the coating is of the proper texture to retain lubricant and facilitate the drawing of metal. The use of Bonderite prior to drawing reduces metal-to-metal contact, prolongs tool life, permits faster drawing speeds and deeper draws, reduces material breakage, and gives a smoother finish to the product. This development is in extensive use in seamless steel tube mills, and is also being used for many other deep-drawing operations in the metal industry.

"Parco Lubrizing, a process which reduces wear on bearing surfaces, has been used more and more exensively during the past year on a wide variety of products such as cylinder walls and liners, pistons and piston rings, valve tappets, differential gears, etc. The process is a chemical treatement applied by immersion without the use of an electric current and it produces a nonmetallic oil-absorptive coating of iron and manganese phosphate with a crystalline structure especially favorable for reducing wear during the critical break-in period. The treatment also produces a controlled etch in the metal surface which provides a porous base for the coating, and furnishes minute oil reservoirs even after all traces of the coating have disappeared as a result of wear.

"Improvements have continued in the widely used spraying procedures for preparing metal articles for painting. The size of the equipment and the floor space required have been reduced, and improved equipment design has served to lower maintenance and operating costs. The spray operation of the phosphate solution makes possible the coating of large objects which do not lend themselves to immersion coating methods.

"Bonderizing of blackplate in the steel mills to prepare sheet and strip steel for painting in the flat has saved hundreds of tons of tin. It has become a recognized method of preparing steel for painting in the container industry. The phosphate coating is produced by continuously passing the properly cleaned sheet or strip steel through the Bonderizing solution, or spraying the solution onto the steel, rubber rolls or fiber brushes being used to initiate the coating formation and control its crystalline characteristics, To withstand the most severe forming operations without injury to the phosphate coating, it has been found necessary to limit the amount of coating to not over 100 mg. per sq. ft. of surface. For less severe forming such as bending or embossing, coating weights in excess of this amount have proved satisfactory."

New Uses for Zinc Alloys And Zinc-Coated Products

Ernest V. Gent, secretary, American Zinc Institute Inc., New York: "In the case of zinc, attention to date has been focused upon the requirement and supply situation rather than upon technical developments and new uses. With decontrol, which has brought prices more nearly in line with the world market, supply should come close to matching demand, for with zinc the over-all picture is already close to a balance and any tightness in deliveries mainly concerns the question of grades.

"Production of zinc-coated products, while at a high point, seems never to be adequate to meet the needs—but this is a matter of steel, and not zinc, supply. The galvanizers are busy with old-line products but find time to turn out electrogalvanized tight-coated sheet and strip for numerous purposes. There is increasing talk of hot-dip coil galvanizing, which is a promising newish development. Extruded zinc and zinc alloy products are now in limited production; and a small, but efficient, new dry battery, in which zinc is an important component, is attracting a good deal of attention.

"Of course, new applications for zinc alloy die castings occur continuously, and expansion in this field has apparently not yet reached its limit."

...AND LIKE IT!

"Practice what you preach" is an adage that has proved its worth at Pennsalt . . . especially at our Michigan works.

DOWNTIME SLASHED FROM 10 DAYS TO 10 HOURS!

At this plant, boiler descaling was previously done by mechanical turbining, involving shut-downs of ten days or more while the unit was being dismantled. A new method—built around our own Pennsalt PM-90 Descaling Compound—completed the entire job in *less than ten hours!* Descaling was more thorough than ever . . . in fact, Pennsalt PM-90 cleaned out pockets probably never cleaned before!

SEND FOR DETAILED REPORT ON THIS CASE!

If you are interested in technical facts on this case, write to address below for Case Report No. 62-1, which contains complete details. And if you have a problem in metal cleaning, plating, enamelling or corrosion-proof construction, call in one of our representatives and let him add our experience to your own.

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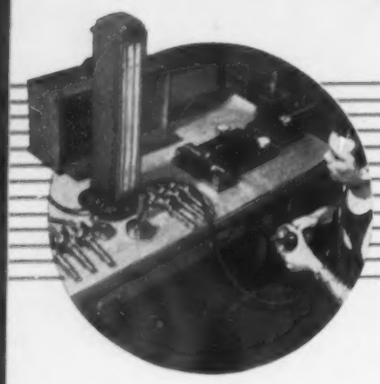


Inspection and Testing

Strain gage provides accurate test data . . . Radiography sets standard of quality in welds . . . Statistical methods aid engineer . . . Hardenability tests increase in importance

More Accurate Tests for Hardenability Foreseen

Henry Wysor, metallurgical engineer, Bethlehem Steel Co., Bethlehem, Pa.: "With the development of scientific methods for determining hardness of metals, and the correlation of data so produced with other mechanical properties, hardenability of steel has become of paramount importance. By hardenability, we mean gradient hardness in homogeneous steel to a measured depth following a specific treatment. Usefulness of such information is so obvious that great effort has been expended toward perfecting hardness tests that are intended to serve as a basis for steel application.

"Potential hardenability information is primarily needed while the heat of steel is in the furnace. Conceivably a test might be devised for direct determination of hardenability before the steel is tapped, but that is not contemplated now.

"By utilizing rapid tests for composition, and noting the rate of oxidation in the bath, the melter may in the future have better controls at his disposal from the blocking of the heat to the final additions in the ladle. The melter must base his calculations on the bath analysis and the desired final analysis and grain size, and estimate hardenability, using constants for different elements. To that extent there should be no objection to a slide-rule heat, and it is well that the melter have the end-use in mind as well as scheduling of the heat through the mills where rolls have probably been set to accommodate the order. For direct information and allocation of the heat the test ingot from the ladle is the most reliable means available.

"While hardenability criteria have generally been confined to medium and deep hardening alloy steels, there is a good deal of interest in extending tests to include relatively shallow-hardening low-alloy and carbon steels, which are used in heat-treated parts. Currently, the Shepard P-V test has been worked out successfully for high-carbon shallow-hardening steels. There is promise that in this or some other modified end-quench method, means may be available for a broader and more accurate testing procedure for hardenability of steels in general.

"In view of the vast amount of cooperative work that has been done, involving exchange of specimens and methods and comparative testing, the future adaptation and use of hardenability of steel seems well assured."

Strain Gage Supplies Designers With Accurate Test Data

Arthur E. Focke, Diamond Chain & Mfg. Co., Indianapolis: "The resistance wire strain gage was one of the most significant developments during the past war. This simple device not only makes it possible to determine strain—and with due precaution, stress—in complicated structures, but also it can be used as an electronic control to apply either a constant stress or stress fluctuation within constant limits.

"Many applications of this device to the determination of the mechanical properties of metals under impact, fatigue or at high rates of strain at low temperatures have already been made. Now it seems definite that, as their use becomes more common, designers will be supplied with accurate test data which will make it possible to reduce with safety our previous 'factors of ignorance.'

"That this reduction of ignorance is essential is obvious in the field of aeronautics, but from the standpoint of our national well being, it is no less important in our common industries."

Supersonic Reflectoscope Probes Interior of Heavy Forgings

James C. Hartley, chief metallurgist, Barium Steel & Forge Inc., Canton, O.: "New developments are seldom reported in the field of flat die forging. Improvements are usually of such a nature as to be modifications of existing techniques which in themselves are not sufficiently significant to warrant publication.

"Recently, however, an improvement in forging methods has been made which does warrant publication, since it provides a method of working materials which are generally conceded to be "sensitive" and hence extremely difficult to forge or work down to any appreciable degree. This is particularly true of the high speed steels and certain of the more highly alloyed, hot work and heat resisting steels.

"Heretofore, it has been necessary to limit the size of ingots to produce sound sections having desirable etch and fracture characteristics in high speed steel. Low recovery caused by inability to correct inherent ingot conditions and by bursts have rendered the forging of high speed from large ingots by conventional methods uneconomical. The present development which consists essentially of breakdown of high speed or highly alloyed ingots to rounds or squares in V-dies or in a combination of V and flat die has removed many of the limitations on ingot sizes which previously were a barrier to economical production. Yields of 67 to 80 per cent by this method in forging down 18 to 24-in. ingots in 18-4-1 and other types of high speed steel are now common practice; and it has been possible to obtain etches and fractures which compare favorably with upset forged blanks.

"The process, which is in the patent application stage, is a development of Barium Steel & Forge Inc., and is known as the Shetler process. High yields have been obtained on a considerable tonnage of the most difficult and sensitive ma-

terials to which the forging industry is subjected, and consistently high quality of centers has been maintained.

"A second development in forging is use of the supersonic reflectoscope in inspection. It is possible for the first time in the history of metallurgy to nondestructively examine the interior of heavy sections. Limitations of surface condition of the part under test which at first were a serious drawback to the use of the reflectoscope have now been largely eliminated, and it is possible to inspect directly on a reasonably flat, forged or rolled surface, care being taken to remove only the loose scale and testing directly through tightly adhering scale. Later developments have also made it possible to inspect large rounds without recourse to curved or completely contoured crystals.

"The reflectoscope operates beyond the limitations of present day x-ray equipment in that it is able to detect laminations and small cracks. It is able to inspect steel sections in thicknesses of 10 ft or more. Its major limitation is the inability to test very close to the surface or to inspect very thin pieces. Since the latter field is competently covered by x-ray and magnaflux inspection methods, the limitation is not a serious one. Use of the reflectoscope on heavy forgings promotes more intelligent quality control, since it permits a statistical study of internal defects to be made and correlated with service life.

Development of reflectoscope techniques has now progressed to the point where it appears that it may soon be feasible to check grain structure in a finished piece, and differentiate between fine and coarse grain or to check heat treatment by a study of the damping capacity of the piece, as indicated by the number of successive back reflections which are obtained under given conditions. This development should greatly increase the scope and utility of the reflectoscope."

Inspection at Machines Offers Many Advantages

Louis Polk, president, Sheffield Corp., Dayton, O.: "Industry is moving steadily in the direction of better quality control of parts during the various manufacturing operations rather than depending chiefly on occasional or final inspection to assure meeting established standards.

"Production managers have been properly very realistic about quality control. It has had to pay its way through scrap reduction, elimination of waste, and assurance of uniformly good products. Somewhat as a paradox, it has made possible better workmanship and in numerous cases increased earnings for piece-workers, while at the same time reducing overall costs of production.

"The trend continues toward inspection right at the machine so the operator can check his work and know when it is within tolerance limits. This has a great many advantages, and not the least of them is the reaction of an individual who takes greater pride and makes a more determined effort to turn out good work within expected time standards. The human element of error is being reduced by mechanical aids, which benefit the workman as much as the management. The work is easier, the results more certain, and the customer has greater assurance of getting uniformly good products that will give the service expected of them."

New Devices Aid in Measuring Temperature of Liquid Steel

J. S. Marsh, research section, development and research department, Bethlehem Steel Co., Bethlehem, Pa.: "Outstanding activities of steelmakers stemmed from reconversion and from the use of oxygen. At last there has been time to review the mass of performance data collected during the war years and to evaluate more fully the information that was interchanged so freely. These tasks are not yet completed; however, it was inevitable that the general level of efficiency of steelmaking should be raised by such activity.

"An old problem—temperature measurement of liquid steel—received more attention than ever before by a number of plants. A large part of such expanded activity may be ascribed to the appearance on the market of several devices specifically designed for the purpose. Two principal types of instruments are under test: (1) immersion thermocouple and, (2) blowing tube. Variations of the latter include thermopile and photronic-cell units. Opinion seems to be generally that existing designs are open to certain improvements and techniques are hardly at the routine stage; however, it is certain that bath-temperature measurement is becoming less and less a job for research men.

"The item of the year that stirred up the liveliest interest was oxygen. So much has been printed and so much more has been passed by word-of-mouth at high velocity that repetition is scarcely necessary. It might be of interest to point out that the American Institute of Mining and Metallurgical Engineers held in Feb., 1924, a symposium on the use of oxygenated air in metallurgical operations."

Electronic Grinder Control Eliminates Off-Size Work

J. Manuele, director of quality control, headquarters Mfg. Division, Westinghouse Electric Corp., East Pittsburgh, Pa.: "A new electric gage has been developed which automatically backs the grinding wheel away from the work when the proper size has been attained. It consists of a gaging head and a control solenoid. The gage is mounted directly on the grinder and functions independently of the operator. It is particularly adaptable for controlling the grinding of cylindrical objects such as shafts and journals.

"In grinding journals within a total tolerance of 0.0003-in. difficulty was encountered in maintaining size. The operator found it practically impossible to finish every shaft within the tolerance specified. Some shafts were oversize and some were undersize. To correct this situation, a gage of the conventional type was installed on the grinder. This used a dial indicator for registering the size of the work, and some improvement was noted immediately.

"It was felt that if the dial indicator were replaced by an electric gage, the operator would be able to read it more accurately and hence produce better shafts. After the electric gage was installed off-size shafts were practically eliminated. But it was still necessary for the operator to watch the gage, and back off the grinding wheel when the required size was obtained. This meant that if the operator's nerve reaction was a bit slow, or if he jumped the gun, off-size shafts would be produced. Therefore, a solenoid was placed in the gage circuit. Its function was to back off the

grinding wheel when the shaft was ground to the proper size.

"Now an operator just adjusts the gage by means of a master shaft and starts the grinder. His other duties consist merely of loading and unloading the grinder, and placing the gage head over the work. The gage starts the wheel into the work, and continues the feed until the correct size has been obtained, at which point the feed is reversed and the wheel is backed off.

"Use of the gage increased production to 300 per cent. Quality is so improved that practically all shafts are finished to within a total tolerance of 0.0001-in., eliminating the customary detail inspection."

Rigid "Spec" Experiences Make Producers Quality Conscious

W. B. Coleman, W. B. Coleman & Co., Philadelphia: "In the testing and inspection field, the recent hectic times with rigid Federal specifications have made most consumers and producers quality conscious. This has resulted in a more thorough inspection program. In the past months, not only new types of test equipment have been introduced but improvements to existing equipment. All of these point to one goal—quality.

"Some of the new equipment was designed for testing or comparing properties of metals that were heretofore either unknown, or little significance was attached to them. While many of the improvements were along electronic lines, such as fluoroscopic, supersonic, and x-ray testing, there were also refinements of general laboratory equipment. These eliminated, in most cases, lengthy and tedious operations. All refinements enabled the chemist to obtain results in less time and, in some cases, definitely improved the accuracy of the methods.

"An outstanding improvement that is brought to mind at this time is the progress made in spectrographic analyses. It is now possible to determine quantitatively at the same time a number of elements in an alloy. This is accomplished by the light of the spectrum through optical and electrical means setting up a current in proportion to the percentage of each element present, the result being obtained by reading the amount of each element present directly in percentage. This procedure eliminates the necessity of photographing the spectrum. It saves time and in some cases even proves more accurate than some of the procedures now in practice.

"It is my opinion the near future will see even greater strides forward along these particular lines, all pointing to closer control which means a better quality in the finished product."

Radiographic Inspection Important in Quality Control

John J. Chyle, A. O. Smith Corp., Milwaukee: "The radiographic method of inspection has contributed more toward the improvement of the quality factor in metallic arc welding processes during the last 5 years than all other inspection methods combined.

"Other inspection methods, such as physical testing, magnetic inspection, trepanning, chemical analyses, etc., are also important and are used widely, however, they are not substitutes for radiographic inspection. These other methods, with the exception of magnetic inspection, are destructive and therefore cannot be applied to the entire structure for complete examination.

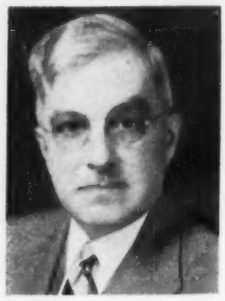
"Radiographic inspection is accepted today as a method of determining weld quality and many welded products are accepted or rejected on the basis of x-ray examination. The radiographic examination is also used extensively to train and qualify arc welders, to develop suitable welding procedures, and to aid in welding research.

"The increase of radiographic examination in the last few years has been tremendous all over the country. At our plant, the daily processing of x-ray film amounts to 8300 ft or 99,500 in., which must be critically examined for defects. In some departments, where extra high standards of x-ray inspection are necessary, the welders are paid on the basis of radiographic examination. Both the quality of the products and the wage scale are dependent upon this control.

"Radiographic examination primarily differentiates variations in density of matter, and it is for this reason that the method is so successful in examining welds. Variation in density of weld metal is due to the presence of one or more of the following defects: Gas cavities, cracks, laminations, slag, oxides or other nonmetallic inclusions. Defects indicated in radiographs can be classified as those attributable to (1) unskilled operator, (2) wrong procedure or use of equipment and (3) inferior quality of material.

"In order to improve the quality of welding by radiographic examination, it is important to co-ordinate the defects as found on the film with factors causing them and, therefore, it is necessary to thoroughly train inspectors in order that they can give the correct interpretation. Correct interpretation of radiographs of welded assemblies is difficult and requires experience and good judgment on the inspector's part".

Use of Formal Statistical Methods Aids the Engineer



H. A. Schwartz, manager of research, National Malleable & Steel Castings Co., Cleveland: "Possibly one of the most significant developments in the metalworking industries is the continued application of formal statistical methods, generally under the name 'Quality Control'. These methods can be and have been applied to the maintenance of constant properties, technical or mechanical, in metal products, assuring that there is no probability that the required quality will fall below some expected value.

"The procedures are also applicable to the formulation of specifications in that they permit predictions as to the minimum range of a given property which can be maintained in a given state of development of the art. From such knowledge it is possible to predict systematically with what design values the engineer must reckon when considering the use of a given material for any specified part.

"The same principles, particularly in that modification known as 'sequential inspection', also permit of the reduction to a minimum of the labor and cost of inspecting a given material to insure maintenance of quality is the part being produced.

"Societies devoted to such statistical analyses in engineering industries are springing up in all manufacturing centers and a national organization has been formed."

A pocket-fitting set of surface finish standards which conform to the preferred-number series adopted by American Standards Association, consists of 20 small blocks of stainless steel. Made by University Machine Co. Division of Baird Associates, Cambridge, Mass., blocks are used by inspector by drawing his fingernail across the specimen and across the standard.

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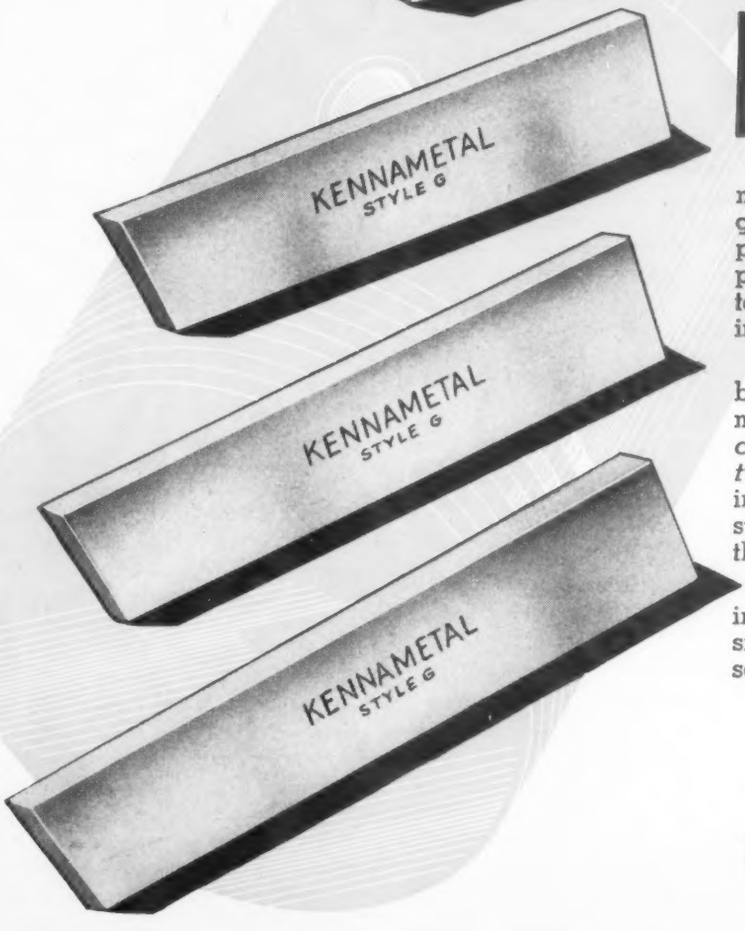
More Than

TWICE AS RIGID

These Grooving Tool Blades Are

TWENTY TIMES AS PRODUCTIVE



Weaving—major cause of excessive wear in slender grooving tool blades—can now be overcome by using sturdy, hard blades of solid Kennametal. Here's one example—

In a large automobile plant, solid Kennametal blades are now cutting piston ring grooves in 18,000 to 20,000 aluminum alloy pistons before resharpening, whereas the previously-used carbide-tipped steel-shank tools had to be serviced after cutting grooves in 800 pistons.

These new solid Kennametal blades cut better, longer, not simply because they are much *harder* than steel, *but primarily because their resistance to deflection is two to three times* as great as steel. Weaving that causes erratic cutting pressures, strains, and rapid cutting edge failure is thereby minimized.

Kennametal grooving tool blades are made in standard widths from .080" to .250". Other sizes are available. Ask our nearest representative, or write for prices and particulars.

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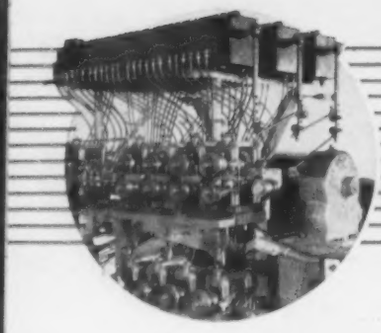


Lubrication

Simplified lubrication system contributes to efficient production . . . Extreme pressure lubricants ideal for worm gears

Simplified Lubrication System Contributes to Plant Efficiency

James G. O'Neill, Jr., Sinclair Refining Co., New York: "The wartime practice of simplifying the number and types of lubricants contributed a part in efficiency of production. The modern up-to-date industrial plant is continuing this practice in peacetime.

"Efficient simplified lubrication has obvious benefits. With a greatly reduced number of lubricants efficient practices can be instituted. Storage space can be reduced. Containers can be arranged to insure cleanliness and easier handling. The dispensing equipment can be selected to obtain adaptability for many lubricating operations instead of a few. Errors in application can be minimized.

"The attainment of an efficient simplified lubrication procedure is generally reflected in greater plant efficiency. As the condition of blood in a living creature reflects the general health, so the condition and application of lubricants in an industrial plant generally indicates that plant's efficiency."

Extreme Pressure Lubricants Recommended for Worm Gears

B. F. Hunter, consulting engineer, Honan-Crane Corp., Lebanon, Ind.: "The development of the so-called 'extreme pressure' lubricants was a worthwhile contribution of petroleum technologists and marked a milestone in the progress and science of lubrication. Their popularity and use throughout industry is increasing daily, and a more general, wide-spread use of 'EP' lubricants can be expected when their characteristics and action are better understood.

"The combined sulphur in a lubricant of this type may be regarded as dormant until the surface of the metal with which it is in contact reaches a temperature approximating 400° F, when the sulphur becomes active, forming a metallic sulphide. So-called 'extreme pressure' lubricants, therefore, are inactive and possess no more load-carrying properties than the lubricant with which 'EP' agents are combined until the temperature approximating 400° F is reached.

"'Extreme pressure' lubricants of good quality are ideal lubricants for worm gears; and, when these facts become more generally known and proved throughout industry, the general use of 'extreme pressure' lubricants for worm gears may be expected and industry may profit by uninterrupted service and reduced maintenance cost. The life of 'extreme pressure' lubricants in a worm gear unit will vary with the severity of service and temperature conditions, and in every instance should be the equal of compounded cylinder oils, and much longer under normal conditions.

"The corrosive tendencies or characteristics of the earlier EP lubricant are perhaps the greatest obstacle in their way, limiting their more general and wider use. Today many equipment manufacturers as well as bearing manufacturers condemn the use of 'hypoid gear lubricants', extreme pressure lubricants', based on the theory they are corrosive to metals and accelerate wear.

"This too general condemnation of 'EP' lubricants is unfortunate for industry, and is without justification. When we stop to consider, there are millions of hypoid gears in automobiles, trucks, tractors and other mobile equipment in which the finest, most precision-built ball and roller bearings are employed as parts of the assembly, are being and have been lubricated for years, with 'extreme pressure' lubricants, with bearing or gear failures a rare occurrence.

"The question frequently arises as to the reaction of so-called 'extreme pressure' or 'sulphur bearing' lubricants in the presence of water. There are exceptions to any rule. There is not, and probably never will be, a universal lubricant completely satisfactory for all lubricating conditions. However, conventional 'EP' lubricants are now being used in large circulating systems for the lubrication of bearing and reduction gear units under some of the most severe conditions to which machinery is subjected and where as much as 10 per cent contamination of water per day or week is encountered. Corrosion is not a problem and bearing and gear life have been increased many, many times.

"During the past several years some of the more progressive and major industries have adopted 'EP' lubricants.

"We are living in a progressive age; and, if industry is to take full advantage of the developments and progress of science, established precedents must be abandoned for more modern advancement."

Effective Lubrication Reduces Costs

E. J. Ehret, The Farval Corp., Cleveland: "Industry in many cases has rushed into reconversion with new and revamped plant setups, concerned only with getting the equipment to go, but without a thought to the fact that all this equipment must be kept lubricated at all times, otherwise a large portion of the return on the original investment is sacrificed.

"The reason lubrication and lubricating systems have been overlooked, is because the man responsible for the project does not appreciate the value of lubrication and lubricating systems, or is too busy at the moment, getting the production line going and lets that feature go for another day.

"The conclusion to be drawn is that in most cases this task should be in the hands of a capable lubrication engineer. Bearings and lubrication for the machinery are his specialties and he can pay for himself many times a year. Only the major industries seem to appreciate this fact. Recent developments in the field of centralized lubrication make it possible to provide positive lubrication to almost any type of machine at a reasonable cost."

Materials Handling

Trend in materials handling toward specially designed equipment based on user requirements . . . Place greater emphasis on pre-planned operations . . . Capacities of industrial truck batteries increase . . . Steel strapping protects products . . . Handling "welds" production

Handling Recognized as Means of "Welding" Production Operations

Lester M. Sears, president Towmotor Corp., Cleveland: "Increased production is the goal toward which every industry is striving today. In the metal working industry particularly, emphasis is being placed upon the search for new materials and methods which will help increase the productive output of machinery and manpower alike. Although the ultimate solution to this problem will undoubtedly be credited to a combination of factors, it is reasonable to assume that materials handling, as a major function in every phase of production, will share prominently in achieving the goal of greater productivity.

"Although handling has always been an indispensable part of every production operation, until recent years its importance has been greatly overlooked. Prior to World War II, materials handling had begun to emerge from its forgotten niche in the production structure. The impetus provided by the armed forces, who found that mechanized materials handling offered the only possible solution to the problem of moving vast quantities of materials and products quickly and efficiently, served to bring handling to the fore in the thinking of management and production men alike.

"Today, materials handling offers the metalworking industry more and greater opportunities to increase production efficiency and productive output. Handling, now recognized as a governor that controls the rate of production, can be the means of welding various production operations into a unified, smoothly-operating system.

"That materials handling will become increasingly important in the metalworking industry is evidenced by the development of special equipment designed to meet the specialized requirements of this industry alone. In my own experience, Towmotor has already produced a number of such accessories. Some, such as the crane arm and the overhead guard, have proved to be of value to many industries and have become standard equipment. Others, less well-known but equally effective in solving some particularly difficult handling problem, have been created as the result of a special survey of handling problems in a single plant and are suitable only for specific operations. An example of this type of attachment is an unusual 'fifth wheel' designed to enable a midwestern plant to transport long, heavy loads of sheet metal through narrow aisleways and around right-angle turns.

"Speaking only of the fork lift truck, the advantages offered by this one form of mechanized materials handling are more than sufficient to warrant its increased use by the metalworking industry. Since materials handling, as a function of production, is the object of further study by efficiency-minded production men and executives, mechanized materials handling equipment, particularly that capable of continuous, full-power service, will find increased favor in this industry. Similarly, as handling equipment manufacturers become more closely allied with the handling problems of the metalworking industry, more specially-designed attachments will be made available to meet the industry's specialized requirements and assist in attaining the goal of increased productivity."

Greater Emphasis Expected On Pre-Planned Operations

R. W. Mallick, section engineer, plant layout & works standards, Westinghouse Electric Corp., East Pittsburgh, Pa.: "We have seen one whole year pass since termination of hostilities of World War II. The reconversion to peacetime production has, in many instances, fallen short of expectations. Numerous factors influence this condition, but one is very evident. Just as we cannot turn back time, so we cannot 'reconvert' to a 1941 industrial economy. We find that we must 're-establish' peacetime production in the light of new techniques, higher productivity, and greater social responsibility.

"Many managements are finding that greater emphasis on more intensive preplanning of industrial operations is paying off in more effective production at lower cost. The field of materials handling will be greatly scrutinized in the next few years. There is no more 'cheap labor' in American industry. Material handling engineering and three dimensional plant layout will play an important role in aiding managements to meet their goals."

Trend Is Toward Special Design Based on Users' Requirements

C. B. Cook, vice president, Elwell - Parker Electric Co., Cleveland: "Technical progress in metalworking is facilitated by means of power industrial trucks to a greater extent than generally known. This is because many improvements in manufacturing equipment and processes are predicated on rapid, economical handling of materials, often under conditions imposing insurmountable obstacles to manual performance. Trucks themselves have been proved to be basic items of equipment in such industries

as steel, automotive, machine tools, transportation; food procesing, paper, glass and rubber, to mention a few besides metalworking.

"Examples of how they tie in with the most advanced types of production equipment are apparent in steel rolling mills, especially in the sheet and tin mills. Rolling and processing units have been built for high speed. Their effectiveness measured by output depends largely on how well all units can work together.

"Theoretically, an ideal condition might be an arrangement whereby there would be no gaps in time or space between the individual stands or stations from raw steel to finished products. But, practically such a condition may never be attained, nor is it necessary, as power trucks provide the links for a vast—yet flexible—system of manufacture. It is significant that no rolling mill equipment has yet been devised with speed or capacity beyond the ability of trucks to handle the output as fast as required for succeeding operations. This is the key to their success in the steel mills.

"One of the serious obstacles encountered in the operation of continuous strip mills was the 'take-away' of the coils, and their movement to reducing mills. Installation of power trucks overcame this difficulty and permitted the rolling of longer, wider, heavier coils. Owing to the trucks' demonstrated reliability for speed and stamina in handling operations, steel mill engineers now contemplate the cold rolling of coils weighing 25,000 to 30,000 lb for tin plate and up to 72,000 lb for sheets, or nearly twice the present size. Maximum rolling speed on hot strip mills now is 2000 fpm, but a mile-long strip will be rolled in relatively less time. New trucks necessary for this work have been built or designed.

"Innumerable examples show the increasing use of trucks in a wide variety of metalworking operations. These range from ordinary types of 'load handling' to ingenious methods for larger, economical production. A southern car wheel foundry devises simple attachments for transporting ladles filled with molten steel and also hot castings on the tines of a fork truck. Hazardous manual work is by-passed. In other plants trucks convey heavy loads of parts to and from heat-treating furnaces. A valve manufacturer transports tanks of quenching oil to furnace discharge ports. Heat-treated parts are raked from the furnace into a tank, and the same truck then picks up the loaded tank on its platform and removes it to the cooling department. Accidents have been practically eliminated.

"In the building and merchandising of trucks there is a pronounced trend toward specialized engineering based on studies of users' requirements, so that they may obtain maximum benefits. High cost of labor and scarcity of men may be largely offset by means of the right kind of mechanical equipment. Many instances are noted where trucks have solved the problem of labor shortages, and by releasing men from the necessities of manual labor have enabled them to train for semi-skilled and skilled production work.

"High-tiering by means of fork trucks in stockrooms and shipping departments has relieved an otherwise difficult building situation for many manufacturers. The so-called 'palletizing' system also has speeded up loading and unloading freight cars, and by reducing turnaround time has tended to relieve the freight car shortage.

"These are a few of the reasons some truck manufacturers are booked up to their own production capacity for a year or more ahead."

Battery Capacities Increase For New Industrial Trucks

George E. Stringfellow, vice president, Storage Battery division, Thomas A. Edison Inc., West Orange, N. J.: "Industrial trucks in the steel industry, considered as a whole, are now employed for so wide a variety of handling operations that their operation has become virtually continuous. As a result, higher battery capacities are being adopted in order to provide ample power for not less than one full 8-hour shift.

"As recently as 5 years ago, 4000-lb fork-lift trucks were commonly equipped with 24 C8 batteries (rated capacity 12.96 kwhr). Today 30 D7s (rated capacity 18.90 kwhr) and 24 D10s (rated capacity 21.60 kwhr) are much more typical. Ram trucks in the general range of 10,000 to 14,000 lb are another example. Before the war, one of the most common batteries used in this type of truck consisted of 48 D10s (rated capacity 32.40 kwhr). Today, a typical battery would be 48 D10s (rated capacity 43.20 kwhr).

"The work of industrial trucks in picking up, carrying and setting down unit loads involves frequent starts and stops. The characteristics of storage battery power and high-torque series-wound direct current motors—notably instant starting, high rate acceleration and no power consumption during the frequent stops—have proved to be well adapted to the work. The fact that batteries can be exchanged, usually at intervals of 8 to 12 hours, also increases truck availability in that while one battery operates the truck, another battery is being charged and given any necessary routine maintenance."

Steel Strapping Safeguards Products Shipped for Export

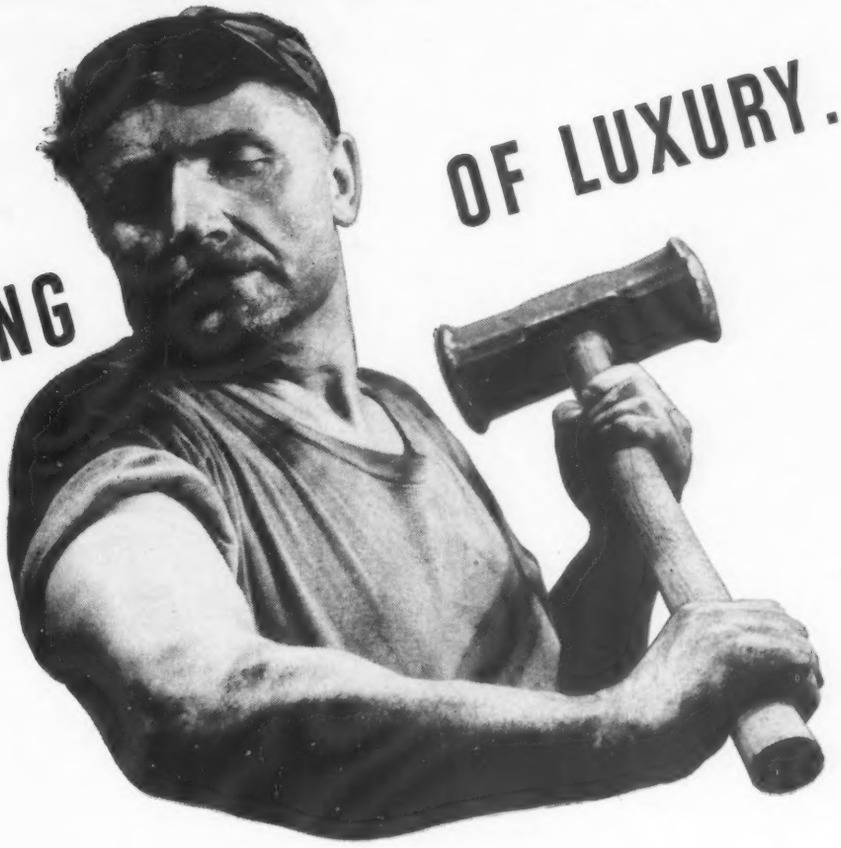
Adolf Larsen, vice president, sales, Gerrard Steel Strapping Co., Chicago: "Steel plays an important and growing role in shipping protection, acting as reinforcement on shipping boxes, crates, cartons, bundles and even in carload stowage of shipments, in the guise of steel strapping.

"Since the war ended, both European and Asiatic ports are constantly subject to theft and pilferage by hungry and improverished dock workers, coolies, itinerant transport agents and other handlers intent on moving goods into local black market channels. As a result, various shipping and port authorities have prescribed round and flat steel strapping as one method whereby theft and pilferage might be greatly minimized and in some cases prevented altogether.

"War's tremendous uses of steel strapping proved that steel's reinforcement kept wooden boxes and crates so rigid and tight that arrival at destination of their cargoes was assured—and ammunition and food, the lifeblood of armies and navies then were the maximum need. Now with export to impoverished countries increasing the sales horizon, the value to export shippers for protection by steel strapping is indeed almost immeasurable. The same applies to domestic shippers in such things as drugs, cigars and cigarettes, cosmetics, perfumes, wines and whiskies, ladies' garments, fur coats, and other clothing, building hardware and shotgun shells, where pilferage is always a heavy insurance risk unless the package or carton is protected by steel strapping.

"Smooth round galvanized steel or coppered steel strands serve as a means for protecting packages from this pilferage by interlocking and cross-tieing methods which prevent the binders from being pulled off."

SPEAKING OF LUXURY...



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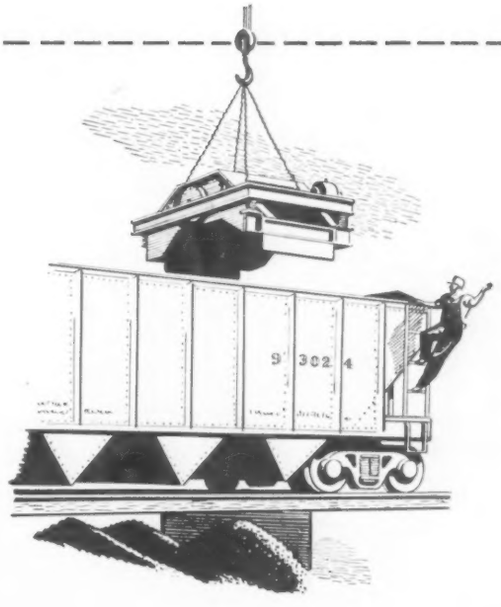
They do your job cheaper. For example, two men can do the work of six or more men. And no expensive installations are needed.

They do your job faster. Packed hopper cars can be unloaded in minutes—not hours. This means cars and locomotives are released sooner.

They do your job better. Robins car shakeouts empty cars "broom clean." And they do so without injury to cars or loads.

So, solve your unloading problems . . . cut your unloading expenses with a Robins car shakeout. Write today for complete information.



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(*Concluded from page* 239)

completely free of surface frost or moisture.

"This new technique of assembly will adequately meet the demand for shrink-fitting operations that cannot now be accomplished by any existing methods."

Many High-Production Programs Will Employ Pressure Welding

R. A. Kubli, development engineer, The Linde Air Products Co., New York: "An increasing number of highly stressed aircraft parts, including landing struts and propeller hubs, are now being fabricated by oxy-acetylene pressure-welding. The resultant increase in joint efficiency allows a sizable reduction in weight over conventional methods. Three and four-bladed propeller hubs are now produced by forging two half sections and joining them in a plane.

"This rapidly developing manufacturing technique results in better economies, with no loss in strength over the former one-piece article. This method greatly simplifies manufacturing operations and lightens the handling burden; also the lighter half sections can be easily formed to very close tolerances. In some instances the welding technique eliminates the necessity for removing nearly 300 lb of expensive alloy steel by machining, as is required in the one-piece hubs.

"The process produces excellent quality welds in high-alloy steel, and this ability is being exploited to join circular half sections of 18-8 and 25-20 stainless steel into continuous rings for aircraft power units. Two simultaneous welds are produced in cross sections up to 7½ sq in. per joint with ring diameters approximating 20 in.

"The process is being used in the automotive field with an automatic welding machine that joins wheel spiders to axle housing on a production basis. Increased savings and an extremely low rejection rate on welded parts were the prime factors influencing the changeover. Initial housings were heavy-wall, tubular sections of SAE 1046 steel intended for use on light to medium-weight trucks.

"The scope of the oxyacetylene pressure-welding process has been extended to include welding of cross sections up to 50 sq in. Commercially welded items in this size range include forging hammer rods 6 to 8 in. in diameter. The process can save many pounds of expensive steel through reclamation of broken sections.

"It is expected that in addition to continued use as a method of producing premium quality welds, the process will be used for increasingly high-production applications, such as the welding of axle housings, where the resulting economies, simplicity, and cleanliness stand out favorably."

Arc Welding in Protective Atmosphere in Commercial Use

G. O. Hoglund, chief, welding section jobbing division, Aluminum Co. of America, New Kensington, Pa.: "The most signicant development in welding the aluminum alloys during 1946 has been the adaption to commercial production of arc welding in a protective atmosphere. Most of the applications involve the use of alternating current, a tungsten electrode, and an argon atmosphere. For example, beer barrels, tankage, furniture, dairy and chemical equipment, and general structural welding are using the method. It seems to be apparent that the method will open wider fields for application of the aluminum alloys and, in addition, displace the conventional gas and arc welding processes in many industrial applications.

"The basic art of tungsten arc welding was established in the 1920's, but few applications were made on aluminum until the process was tried commercially during World War II. The necessity of welding certain parts without using a welding flux forced the development of the method. Since the war, further development of equipment and procedure has taken place.

"Welds made with the tungsten arc exhibit better soundness on the average than welds made by any other welding method. Preliminary investigations on the mechanical properties show high strength. Indications are that maximum strength for weldable aluminum alloys may be raised for welds made with tungsten arc as compared to similar welds made with the metal arc, although more data will be required to substantiate this.

"Procedure has been adapted for both mechanized and manual welding. Welding equipment for materials in thicknesses up to ⅜-in. is readily available. Experimental welding on much heavier metal has been accomplished and equipment will soon be available for welding thicknesses in excess of 1 in.

"Other commercial welding and brazing procedures are widely used on the aluminum materials for peacetime production. Practically all of that portion of the wartime welding equipment specifically adapted to welding the aluminum alloys is now in production. This is particularly true of the resistance welding equipment. No outstanding new developments in the latter fields have appeared recently. Application of welding to aluminum alloy products has widened substantially and many experimental projects involving railroad equipment, house construction, industrial applications, chemical tankage, and household appliances are using welded or brazed construction."

Cost of Weldments Must Receive Attention

Irving A. Oehler, director of metallurgy and research, American Welding & Mfg. Co., Warren, O.: "The cost of weldments will have to be closely watched in the competitive period which is now beginning. Design, processing, and inspection must all be reviewed with the aim of cost reduction.

"Careful design based upon functional requirements with proper selection of weld location and welding method can often simplify the welding problem. The incorporation of standard shapes or combinations involving simple castings and forgings may lead to overall savings.

"The use of automatic equipment with adequate controls permits faster production of a more uniform quality. With such equipment, the control of production processes by capable supervisory personnel can greatly reduce the amount of final inspection required.

"The inspection of welded joints is a very appreciable item of cost, and the requirements and inspection of welded joints as called for in some existing codes and specifications have been built around alloy shop production methods. It will be necessary for the welding industry to secure co-operation from various technical societies to revise specifications to bring about full utilization of cost saving methods based upon present day design and production knowledge."

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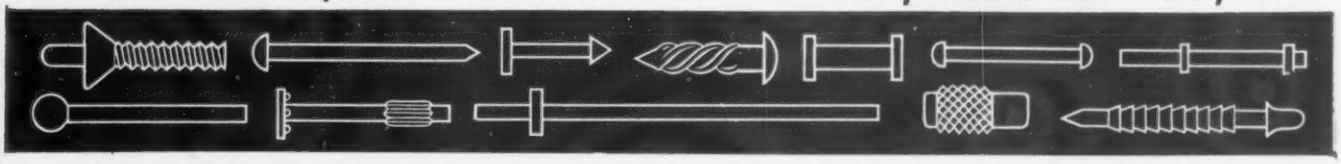

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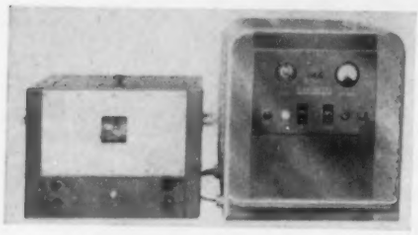
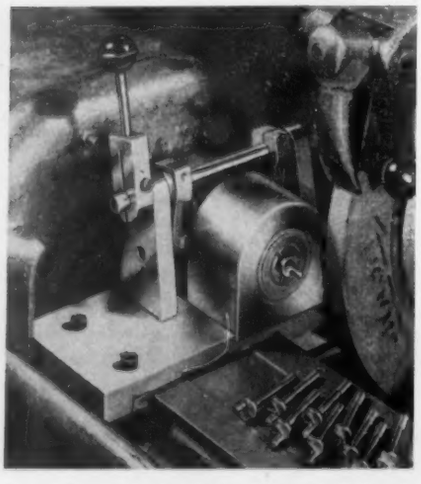


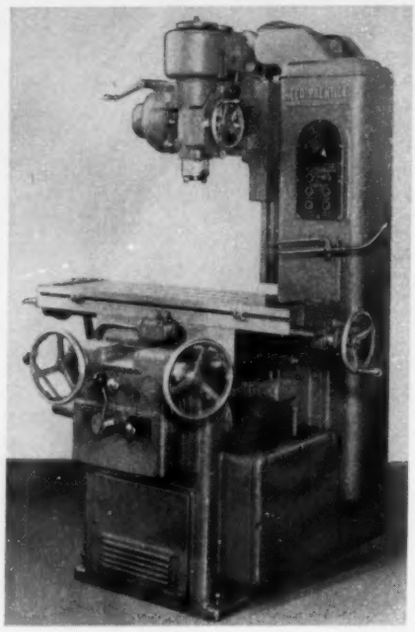
Brazing Generator

Brazing and soldering in small and medium size operations is possible with the 1 kw electronic power generator developed by Radio Corp. of America, Camden, N. J. The Model 1-AL generator, illustrated above, is a vacuum tube unit which converts ordinary 60-cycle line power to a frequency of approximately 400,000 cps. Consisting of two parts, generator and applicator unit, the latter of which can be located as far as 25 ft from the former, the unit is supplied with necessary connecting and remote control cables. Generator unit houses oscillator components, regulated power supply, high voltage rectifier and most of high frequency elements as well as an automatic timing device for presetting interval of operation. Applicator unit houses output current transformer and associated high frequency "tank" circuit components. Heating depth can be regulated by adjusting power and timing. Provision is made for a foot pedal switch to actuate the plate power contactor, if desired.
Steel 1/6/47; *Item No.* 9048

Collet Fixture

Used to grind parts without centers, those that can be held in collets, this new collet fixture, illustrated below, designed by Zagar Tool Inc., 23880 Lakeland boulevard, Cleveland 17, runs on its own ball bearings, and is driven by





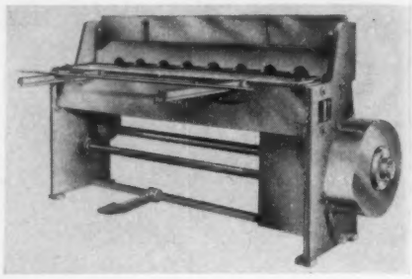
the machine headstock. Collet, which can be opened and closed while grinder is runing, makes it possible to hold overall dimensions, as collet does not move lengthwise. Quickly installed and removed and adaptable to any grinder, its use requires no special attachments.
Steel 1/6/47; *Item No.* 9046

Power Squaring Shears

Metals up to 14 gage are sheared and trimmed with the all-steel power squaring shears such as the one shown, above right, made by Parker Mfg. Co., Santa Monica, Calif. Built of steel plate in box type design and welded and normalized to relieve stresses, the shears stand 47 in. high with a low center of gravity providing vibrationless operation. Cutting length is 73 in., while blade length is 75 in. Back gage range is 18 in., and front gage range is 38 in. Eighty-five strokes per minute are possible with shear, which has a 2-hp motor. Blades are of high carbon tool steel and will cut drawn or folded parts to within 1½-in. of the shoulder.
Steel 1/6/47; *Item No.* 9049

Milling Machine

Electronic control and a universal head are features of the new milling machine, directly above, introduced by Reed-Prentice Corp., Worcester 4, Mass. Its centralized control panel, infinitely variable feeds and spindle speeds, make it suitable for die sinking, duplicating, boring, drilling and face or straddle milling. Gearing is centrally located at front of



machine and is readily accessible. Provision is made for a flywheel which may be mounted at anytime. Head may be adjusted for all angles up to 45 degrees front to back and 30 degrees left to right. Speeds are variable from 90 to 2200 rpm. Feed rates are from ¼ to 24 ipm for cross, the same for the longitudinal feed. Vertical feed of ram is ⅛ to 16 ipm. A one-step rapid traverse also is incorporated. Electronic unit is of constant torque, half wave rectification type. With a table surface of 12 x 46 in., capacity of machine is: Table to spindle, 18 in.; spindle to column (minimum), 12 in.; and spindle to column (maximum), 26 in.
Steel 1/6/47; *Item No.* 9051

Motor Speed Control

Developed for use on any shunt wound direct current motor on lathes, milling machines and drill presses up to and including ½-hp, the electronic motor speed control, shown below, developed by Weltronic Co., 18500 West Eight Mile road, Detroit 19, is for applications where automatic compensation for changing load and changing line voltage is not required. Operation is from 230 v ac single phase power source and output is for 230 v dc motors. Armature voltage is continuously variable for speed control from zero to base speed of motor.

(All claims are those of respective manufacturers, for additional information fill in and return the coupon on page 308)

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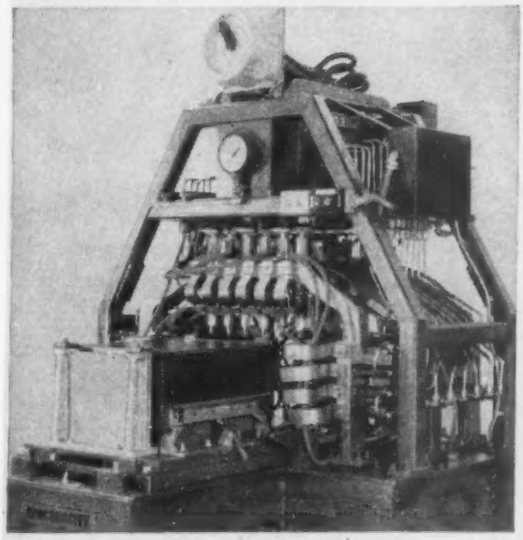
in one easy lesson!



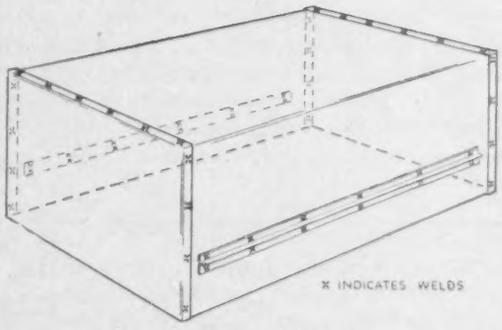
The answer is: not *what* you do, but *how* you do it.

Suppose we take as simple a thing as assembling a metal drawer. You can do it any number of ways. You can rivet, use nut and bolts or some other fastening device, or you can arc-weld (with expert operators). In any event there is a lot of manual handling of the work. Other operations—such as drilling—may be required, and the job takes time: man hours and machine hours.

Or-you can resistance-weld

At the left is a typical Progressive designed-to-the-job machine which automatically assembles a drawer every 15 seconds, making as many as 48 spot welds in each one. All the operator does is drop the parts in place, throw a couple of light toggle clamps and *push a button.*

The result?



The manufacturer keeps his costs and price down. The shop produces more. The worker can justify his high wages while actually doing less physical work.

And the product has been improved!

This is not a special case. It's happening all over the country on all kinds of products. Progressive's ability to design and build the kind of equipment that cuts your costs is what has made it the leading producer of resistance welding equipment today.

We will be glad to study your product from the standpoint of its weldability at lower unit costs.

Are you receiving the Progressive Pictorial? It will bring you regularly the latest news on resistance welding design, methods and equipment.

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RESISTANCE WELDING EQUIPMENT

CABLE ADDRESS "PROGWELD"

MEMBER RWMA

Variable voltage is regulated by a large knob on the front of the cabinet. A switch on front of cabinet provides for forward, reverse and stop operation. The panel containing the switch and the dial can be removed and remotely installed.
Steel 1/6/47; *Item No.* 9052

Portable Air Compressor

Davey Compressor Co., Kent, O., announces a new model 60V portable compressor adaptable for a number of uses. Available in standard skid and 2-wheel

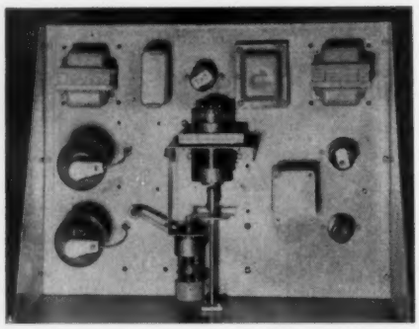
pneumatic tired trailer mounting styles and with flanged wheels for railroad work, it produces 60 cfm at 100 lb pressure. It has one low pressure cylinder with 5 3/4-in. bore and 4 1/2-in. stroke. The high pressure cylinder has 3 5/8-in. bore. Operating speed is 1225 rpm.
Steel 1/6/47; *Item No.* 9887

Control System

Servo follow-up system made by Electronic Associates Inc., 61 Brighton avenue, Long Beach, N. J., has an output torque of 96 in. oz., and can be supplied on special order to control motors up to 1/2-hp. Model 105 has a maximum following speed of approximately 50 rpm.

High positioning accuracy of 0.027 per cent permits use of system in critical measuring systems where remote presentation of measured data such as machine position, water level, dial readings and other data is required.

Controls are located on front panel. These include: Reversing switch which allows clockwise motion to be repro-



duced in either clockwise or counterclockwise direction; gain control—used to adjust for various lengths of connecting line; sensitivity control for adjusting optimum conditions of operation; and on-off switch.
Steel 1/6/47; *Item No.* 9899

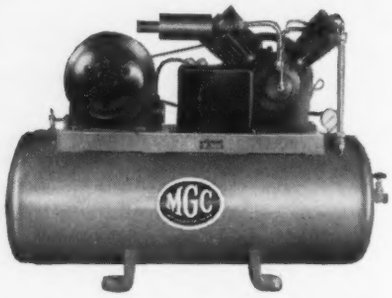
Electrical Conduit

American Metal Hose Branch of American Brass Co., Waterbury 88, Conn., announces a Sealtite electrical conduit for covering electrical wiring used on any type machine which may contact oil or moisture. It meets latest requirements of National Machine Tool Builders Association.

The conduit of galvanized steel flexible tubing is covered with a substantial thickness of oil-proof synthetic material. Fittings are standard pipe thread, and may be permamently attached or reattachable for assembly on the job. Conduit is constructed to resist abrasion and is made in all standard sizes to 2 in. ID.
Steel 1/6/47; *Item No.* 9869

Two Stage Air Compressor

Five new two-stage air compressors are announced by Motor Generator Corp., division of Hobart Bros. Co., Troy, O. They are offered in 7, 9, 13 and 21 cu ft capacities, and all are furnished with 80 gal storage tanks (a 60 gal tank is optional with 7 cu ft model). Compressors are of self-contained type with motor and compressor mounted on a one-piece steel subbase which in turn is



welded to an 80 gal horizontal air receiver. Units are fully automatic and controlled by centrifugal type unloading valves which guarantee against motor burnout.

Power transmission is direct from motor by multiple V-belts. Air pressure is automatically controlled. Both cylinder heads and cylinders have deep fins cast integral which increases the radiating surface for dissipating heat generated during compression of air. In addition, a fan type flywheel forces circulation of air past a copper finned intercooler.
Steel 1/6/47; *Item No.* 9886

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Higher abrasion resistance—less wear; longer tap life

Higher toughness with hardness—less chance of tooth breakage; less tooth chipping of the cutting edge

Higher red hardness—ability to tap efficiently at drill speeds or even higher

Higher torsional strength—greater resistance to twisting and breakage.

These are not idle claims. They are backed up by the performance, in all kinds of service, of hundreds of thousands of "M-11" taps produced prior to this announcement.

Typical is the statement of the Tool Engineer of one of the largest of metal working plants, that his organization has been unable to find any tap to match the "M-11" in performance.

"Of course", he says, "you have to give some of the credit to the kind of tool engineering and accuracy that Detroit Tap puts into its tools. But if you add 'M-11' on top of that—you really have something!"

If you have not yet tried "M-11" taps, you have an eye-opener coming. They are now available at no extra cost—from stock—in practically all standard and many special sizes. Try them on your toughest jobs, if you wish. A complete catalog is available on request.

Request the visit of one of our service men. There is one in your area.
Write, wire, or phone today.

GROUND TAPS
•
THREAD MILLING CUTTERS
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THREAD GAGES AND SPECIAL THREADING TOOLS, MACHINES AND CHECKERS

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"M-11" IS USED ALSO IN ALL OF DETROIT'S THREAD ROLLS, THREAD PLUG GAGES AND THREAD MILLING CUTTERS

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"LOWEST ULTIMATE COST...

...that's Keokuk Electro-Silvery"

When Chief Keokuk says "lowest ultimate cost," he means just that! And Keokuk Electro-Silvery means highest quality and uniformity. The Chief isn't talking through his feathers... he'll prove every word. Write today for complete information.

60-lb. pigs for blocking the open hearth heat.

30-lb. pigs for charging the cupola.

12½-lb. piglets (for foundries) no weighing — charge by count.

KEOKUK ELECTRO-METALS COMPANY

KEOKUK, IOWA

Sales Agents: MILLER AND COMPANY, 332 S. MICHIGAN AVE., Chicago 4, Illinois
3504 Carew Tower, Cincinnati 2, Ohio — 407 N. Eighth Street, St. Louis 1, Missouri

(*Concluded from Page 272*)

operations. Carbide and similar dies are finding a broader application. Large presses are being built in increasing numbers since they can more easily pay for themselves with the increased volume in the metalworking plant.

External Cylindrical Grinder Noted for Repetitive Accuracy

C. D. Day, salesmanager, Grinding Machine Division, Norton Co., Worcester, Mass.: "A new external cylindrical grinder for precision work has proven that grinding to a tolerance of 0.0001-in. or less in diameter, under production conditions and semiautomatically, is practical. This result has long been the desire of grinding machine manufacturers and users.

"The conventional standard cylindrical grinder with automatic wheel infeed provides a uniform rate of body feed which holds the rate of stock removal within certain limits. With this arrangement it has been necessary to embody a period of dwell to secure desired finish on the work. The total time required for actual grinding is determined by the rate of infeed permissible at the last portion of stock being removed. This time is proportioned to the actual amount of stock to be removed and the dwell period is included to provide required finish on the piece being ground.

"On the new grinding machine the rate of body feed permits stock removal by grinding at a faster rate where it can be of advantage and permits the final slower rate for sizing and finish. There is no dwell period of grind by this method, in fact, the wheel is continuously moving forward at the moment the grinding wheel slide is reversed, but its rate of forward motion is infinitely slow.

"The added elements beyond a regular style semiautomatic grinder consist of an electric grinding gage and a hydraulically operated wedge or cam control. This last mentioned element regulates the rate of advancement of the wheel to the work by positive mechanical contact. Naturally, to obtain automatic control within 0.0001-in., proper conditions of work, speeds, feeds and selection of grinding wheel must prevail on the machine at the time.

"A number of these grinders have been installed in production shops and their operation has proven outstanding results of repetitive accuracy. Work has been successfully ground with a stock removal of 0.008-in. and a cycle time of 20 to 25 sec, giving an average of 120 pieces hourly. The finish tested at about 15 micro-inches, and the accuracy for size was within a total variation of 0.000050-in. or 50 millionths of an inch on the diameter. In one plant, continuous production at a rate of 100 pieces per hour has been experienced over a period of months without a single rejection caused by the grinding operation. The separate inspection operation following the grinding was completely eliminated.

"The benefits from the operation of the machine indicate it is practical to obtain automatic work sizing using this device where the product must be held uniformly to a very close tolerance for size. Quality control is assured. Work rejection, oftentimes a serious problem, is reduced to a very minimum because each piece ground is automatically inspected and size controlled. Cost reduction, less operative fatigue, and improved quality of product are important advantages which accrue from the use of the grinder."

Automatic Nut Tappers and Formers Embody New Principles

Richard L. Wilcox, vice president, Waterbury Farrel Foundry & Machine Co., Waterbury, Conn.: "The company's latest automatic nut forming machines are especially designed for manufacturing hexagon nut blanks, including standard double-chamfered, washer faced, castellated, special types of lock-nut blanks, and the like, cold forged from round wire in coils or from rods. They handle capacities of ¼ to 1-in. tap size for all American Standard nuts.

"Many advantages are gained by producing nuts on Waterbury's Machines. Among these may be mentioned high production, uniformity of product, superior finish, increased tensile strength, low cost and small percentage of scrap. Furthermore, after the nut blank has been formed and cleaned, no subsequent operations are required to complete the nut, except cutting the threads. Standard basic open hearth cold drawn round steel is recommended for making cold forged nuts; its physical analysis should conform to specifications recommended by the steel mill as most satisfactory not only for cold forging the blanks, but also for cutting threads.

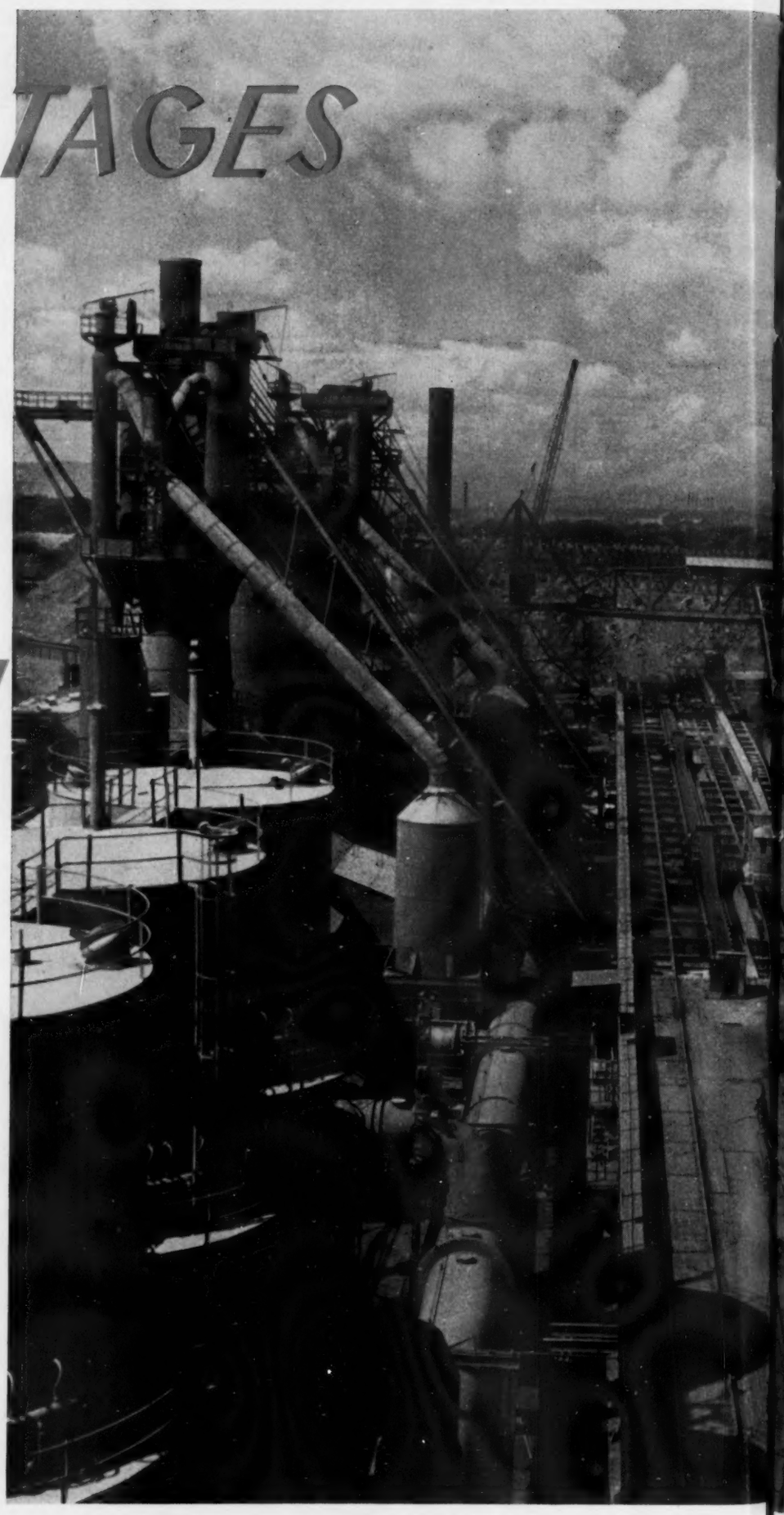
"Nut blanks made on the larger size machines may be produced from rods or bars, instead of from coils of wire. For that reason, the transfer mechanism that carries the blank from station to station is somewhat different from that used on smaller machines. When feeding rods, each is fed against the previous one. To avoid transferring an incomplete endpiece (blank) to the dies, a hand-operated device is provided, that prevents the transference of any short-end pieces, while the machine continues to run at full speed. These crop-ends drop into a funnel and are conveyed through a tube to a receptacle and thus separated from the finished nut blanks. Similarly, all piercings and finished nut blanks are delivered to separate receptacles. The finished nut blanks and piercings are likewise separated on the smaller machines.

"The automatic nut tappers are entirely new and revolutionary in design, employing mechanical principles never used before. They are precision machines with wide range of operating speeds, producing class 3 and 4 fits on a quantity basis, as well as the commercial class 1 and 2 fits at correspondingly higher speeds. Their capacities range from ¼ to 1¼-in. tap size diameter.

"Outstanding feature of these tappers is the stationary straight shank tap. The finished tapped nuts pass successfully along the shank of the tap and drop off the end. The tap does *not* back out of the nut. The straight shank principle eliminates all twisting and 'out-of-square' action. The tap shank is securely gripped while the nut is rotated and is advanced onto the stationary tap by a cam-operated pusher mechanism at exactly the same rate of advance as the lead of the tap thread. This assures that the axis of the threaded hole will be absolutely normal to the face of the nut without any subsequent facing operation to square up the nut face with the threaded hole. The tappers handle any type of hexagon or square nuts having straight sides and a hole through the entire thickness.

"Smaller size nuts from No. 0 to ¼-in. are made by a different process. They are first stamped from the strip metal in a multiple punch roll feed press, then in a secondary machine, they are resheared and double chamfered (or made with one washer face), in an automatic hopper feed high-speed machine, especially designed for this purpose."

SHORTAGES Thwart Europe's Recovery



Economic rehabilitation efforts handicapped by inadequate supplies of coal, steel, scrap and other raw materials as well as manpower crisis in first full postwar year. Progress retarded by uncertainty arising from political proposals aimed at nationalization of basic industries

By VINCENT DELPORT

European Editor, STEEL

LONDON

Industry in EUROPE

SHORTAGE of coal, shortage of scrap, leading up to a world shortage of steel for building and for the metalworking industries. Such is the aspect of the economic balance sheet of the first complete postwar year.

World production of steel ingots and castings in 1946 totaled about 112 million gross tons, equal to 1945 output, but considerably less than 1937 production of 134 million tons.

With the exception of the Ruhr, relatively little damage has been done to the iron and steel works of the principal producing countries of Europe, but, directly or indirectly, it is insufficiency of coal supplies that is the main cause of the steel shortage; other factors intervene but not to the same extent.

Lack of coal is primarily the result of a manpower crisis. In the United States the curtailment of the production of steel has been largely due to strikes in the coal mines. In Europe, particularly in Great Britain, there also have been strikes. But these strikes are the effect of a deeper cause, namely the unwillingness of young people to work in the mines under prewar conditions. This is the case in Great Britain, France and Belgium, and in the German coal mines the problem is intensified by the meager food ration available to the miners; even in Britain the minister of food had to increase the meat ration to the miners—not without claims resulting from the remaining body of workers in the "heavy" industries.

Admittedly coal mining is one of the least attractive industries to young people, particularly at a time when everyone is lured by promises of an ever-increasing standard of living. Inducements are offered in the shape of higher wages, improved working conditions, mechanization. But complete mechanization is not practicable in many European mines although much improvement can be made in that direction, and there are still a large number of trades that are more alluring to young workers. The picture today is of older men, tired by the long hours worked during the war, and having lost much of their vigor, who are unable to give the necessary yield; while many of the younger men are only too prone to absent themselves from work when the opportunity arises—and there are many such opportunities. Great Britain and, to a large extent France, have taken steps to nationalize the mines. Whether the problem will be solved in this way remains to be seen.

There are other reasons why the output of steel is only increasing slowly. In Great Britain better progress would have been made if the reconstruction plan evolved by the British Iron & Steel Federation had not been retarded by the uncertainty caused by government announcements on nationalization of the industry. To say the least, these announcements lacked precision. Now that some reassurance has been given, at least for the next two years to come, modernization and development of iron and steel works are well on the way.

Insofar as the metalworking industries are concerned, production is held back by manpower shortages, shortage of coal, raw and semifinished materials and difficulties of transport.

In France, it is not only the quantity but perhaps even more so it is the quality of metallurgical coke that hampers production. Elsewhere, in Poland and Czechoslovakia, there is not sufficient manpower in the works. As for Germany, the Control Commission has not yet finally decided how much German steelworks will be allowed to produce and, here again, uncertainty is no incentive to production.

Despite all these unfavorable factors, steel production is increasing in the producing countries of Europe. The following analysis is based on estimates of the production of these countries, Russia excepted, for 1946. These estimates are compared with the output for 1937, that year being generally adopted as a basis of comparison because 1938 was abnormally low. Tonnages for 1945 are given in parentheses.

Britain in 1946 will have produced some 12,500,000 tons of steel (11,825,000 tons in 1945) compared with 12,984,000 tons in 1937. France is likely to reach 4,300,000 tons (1,635,000 tons) against 7,793,000 tons in 1937. For Belgium the figures are 2,200,000 tons (720,000 tons) and 3,801,000 tons respectively; for Luxemburg 1,300,-

(*Please turn to Page* 372)

View of highline, stockyard, furnaces and gas washing towers from top of ore screen house of Colvilles Ltd., Motherwell, Scotland

BRITISH

Push Steel Industry

Improvement programs proceeding with proposal to nationalize the industry temporarily shelved. Trade still state-controlled and is expected to remain so indefinitely. Manufacturing industries make headway slowly with steel supply short. Automobile production hampered

BIRMINGHAM, ENG.

BRITISH steel manufacturers faced a difficult task in 1946. They were charged with exporting as much as possible and, at the same time, meeting the needs of the home market.

For the time being, the threat of nationalization no longer raises its ugly head, though presumably the matter has been shelved only because the labor government has more urgent problems on hand. Nevertheless, the trade is definitely state-directed and controlled and it appears that it will remain so for a long time.

Although at the beginning of the year a steel famine was foreseen, allocations for export were made which resulted in the shipment of one and a half million tons in the first eight months of the year, and while the figures for the whole year are not available they are estimated at more than 2 million tons. Thus it comes about that domestic users are living on what some of them describe as "starvation diet." Little comfort comes from official quarters on this question of supplies. Minister of Supply John Wilmot said recently that the demand for steel for the automobile industry was running in excess of the available supplies, and the latter had to be so allocated as to meet the needs of vital programs and to provide a balanced industrial distribution. He could not guarantee that the automobile industry would have priority over all other consumers.

Workers in that industry have been warned as to the likely effects of the steel shortage. Sir Charles Bartlett, managing director of Vauxhall Motors, says the scheduled output of 80,000 vehicles for 1947 will need to be cut to 55,000; and prices will have to be increased.

This generally is the attitude of the trade to the cuts in allocations of sheet steel made in the later months of the year. The automobile industry was placed fourth on the list in the matter of priority. Demand for automobiles has never been greater than it is today, but it is estimated that the industry is working at approximately 50 per cent of prewar capacity and that, of the total vehicles turned out, about one half are being sent abroad. With the cut in steel supplies production may drop in some cases as much as 35 per cent and generally will be much lower than

WORLD PRODUCTION OF STEEL INGOTS AND CASTINGS

Gross Tons

	1946*	1945	1944	1943	1942	1941	1940	1939	1938	1937
United States	59,000,000	71,162,164	80,037,116	79,318,314	76,813,429	73,963,624	60,518,419	47,672,195	28,693,000	51,526,000
Canada	2,500,000	2,568,000	2,712,000	2,664,000	2,748,000	2,424,000	2,016,000	1,356,000	1,128,000	1,352,000
Great Britain	12,500,000	11,825,000	12,142,200	13,031,000	12,941,700	12,312,200	12,975,300	13,221,300	10,398,000	12,984,000
France†	4,300,000	1,635,000	1,275,000	2,325,000	2,160,000	2,350,000	3,290,000	7,820,000	6,121,000	7,793,000
Belgium	2,200,000	720,000	612,000	1,644,000	1,356,000	1,596,000	1,860,000	3,060,000	2,242,500	3,801,000
Luxemburg	1,325,000	260,000	.....	.....	.....	.....	1,296,000	1,735,000	1,414,000	2,470,000
Italy	600,000	400,000	.....	.....	1,900,000	.....	2,265,000	2,350,000	2,286,000	2,054,000
Spain	635,000	550,000	625,000	650,000	590,000	565,000	685,000	575,000	565,000	100,000
Sweden	1,200,000	1,175,000	1,175,000	1,200,000	1,210,000	1,140,000	1,130,000	1,130,000	963,000	1,088,000
Germany‡	2,700,000	1,970,000	25,000,000	30,000,000	28,000,000	27,700,000	20,500,000	22,000,000	22,300,000	19,531,000
Austria	100,000	.....	.....	.....	.....	.....	.....	.....	.....	640,000
Czechoslovakia	1,700,000	950,000	.....	.....	.....	.....	.....	1,250,000	1,733,000	2,881,000
Poland	1,150,000	525,000	1,350,000	1,475,000	.....	.....	.....	1,600,000	1,517,000	1,420,000
Hungary	.....	.....	.....	.....	.....	.....	.....	750,000	638,000	654,000
Russia	18,000,000	15,000,000	.....	.....	.....	.....	.....	18,500,000	18,150,000	17,493,000
Japan§	600,000	1,050,000	5,755,000	7,708,000	6,931,000	6,726,000	6,746,000	6,590,000	6,368,000	5,718,000
India	1,400,000	1,355,000	1,370,000	1,400,000	1,340,000	1,400,000	1,300,000	1,050,000	936,000	895,000
Australia	1,300,000	1,200,000	.....	.....	.....	.....	.....	1,200,000	1,151,000	1,074,000
Miscellaneous	1,000,000	1,000,000	.....	.....	.....	.....	.....	900,000	900,000	900,000
WORLD TOTAL	112,210,000	113,345,164	.....	.....	.....	.....	.....	132,469,195	107,135,000	133,774,000

* Estimated. † Without Alsace Lorraine since 1940.
‡ Includes Austrian production from 1938 to 1945. All occupied zones of Germany proper since September 1945. § Home islands only.

By J. A. HORTON
British Correspondent, STEEL

Modernization

Industry in EUROPE

originally planned for 1947. Some idea of the importance of the industry can be gaged when it is realized that in 1937 Britain manufactured 390,000 private cars and 108,000 commercial vehicles. Of these about 15 per cent were exported, mostly to the Empire, the value being about sixteen million pounds sterling. Of the private cars something like 68,000 went to the Dominions and Empire countries and 10,000 to foreign countries. Commercial vehicles exported to the Empire numbered about 15,000 and to foreign countries 5000. In 1946 overseas business in private cars comprised approximately 50 per cent of output and the government spokesmen have expressed the hope that that proportion will be maintained when production expands.

Behind the steel shortage is the lack of fuel. Early in 1946 it was hoped there would be a steady increase in output at the mines. But despite the fact that there have been no major stoppages in the industry production has fallen short of expectations. A bus strike in Wales in October, for example, caused a loss of some 34,000 tons of coal through inability to transport workers to the pits. Not until coal production has been increased substantially will it be possible to resume export trade. Britain will then find in all probability stronger competition than she encountered before the war, especially in Europe in countries which previously drew the bulk of their supplies

(*Please turn to Page* 364)

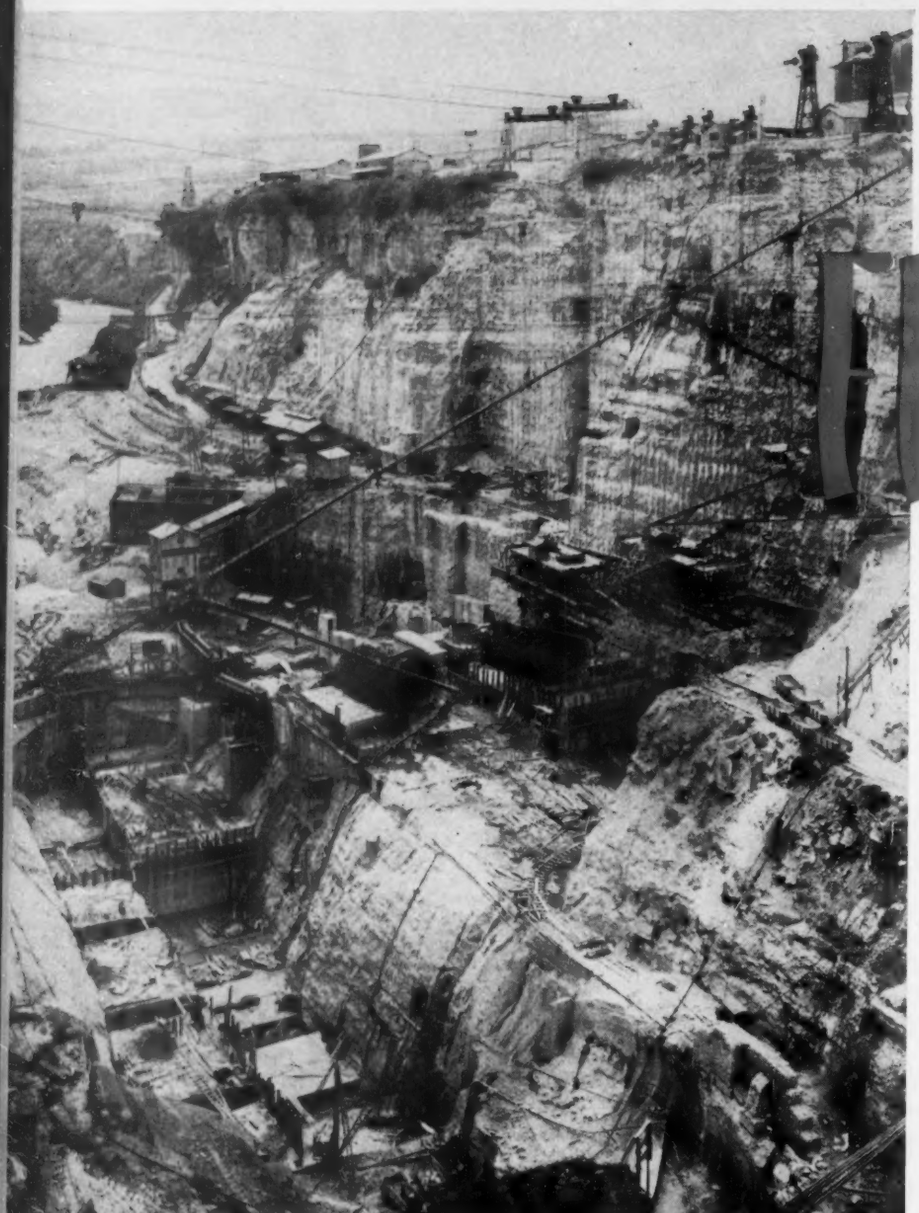
Eighteen-inch continuous billet mill at the Steel, Peech & Tozer branch of the United Steel Cos. Ltd., Rotherham, England

WORLD PRODUCTION OF PIG IRON AND FERROALLOYS

Gross Tons

	1946°	1945	1944	1943	1942	1941	1940	1939	1938	1937
United States	40,000,000	48,363,466	56,130,534	56,044,595	53,555,497	45,042,023	42,320,011	31,943,000	19,161,000	37,127,000
Canada	1,700,000	1,750,000	1,800,000	1,760,000	1,950,000	1,560,000	1,300,000	830,000	756,000	979,000
Great Britain	7,700,000	7,107,400	6,736,500	7,186,900	7,725,600	7,392,500	8,204,600	7,979,800	6,761,100	8,493,000
France†	3,325,000	1,165,000	1,092,000	1,392,000	1,560,000	1,476,000	3,605,000	7,260,000	5,915,800	7,787,000
Belgium	2,000,000	717,000	696,000	1,608,000	1,248,000	1,404,000	1,764,000	3,023,000	2,387,000	3,743,000
Luxemburg	1,385,000	313,000	.....	.....	.....	.....	.....	1,809,000	1,526,000	2,473,000
Italy	400,000	65,000	.....	.....	890,000	.....	.....	1,000,000	913,000	849,000
Spain	500,000	455,000	540,000	590,000	540,000	530,000	575,000	480,000	435,000	126,000
Sweden	720,000	770,000	850,000	790,000	755,000	730,000	780,000	685,000	708,000	682,000
Germany‡	2,200,000	1,476,000	18,700,000	23,800,000	21,850,000	21,060,000	19,000,000	17,485,000	17,785,000	15,703,000
Austria	55,000	.....	.....	.....	.....	.....	.....	.....	.....	383,000
Czechoslovakia	925,000	500,000	.....	.....	.....	.....	.....	1,000,000	1,133,000	1,648,000
Poland	700,000	240,000	.....	.....	.....	.....	.....	1,000,000	936,000	712,000
Hungary	.....	.....	.....	.....	.....	.....	.....	450,000	330,000	350,000
Russia	15,000,000	12,000,000	.....	.....	.....	.....	.....	15,000,000	14,750,000	14,288,000
Japan§	155,000	500,000	2,523,000	3,743,000	4,050,000	4,023,000	3,362,000	3,020,000	2,892,000	2,758,000
India	1,650,000	1,380,000	1,428,000	1,764,000	1,848,000	2,040,000	2,016,000	1,764,000	1,572,000	1,629,000
Australia	1,200,000	1,100,000	.....	.....	.....	.....	.....	1,100,000	1,072,000	914,000
Miscellaneous	1,250,000	1,200,000	.....	.....	.....	.....	.....	1,200,000	1,150,000	1,200,000
WORLD TOTAL	80,865,000	77,351,866	.....	.....	.....	.....	.....	97,028,800	80,182,900	101,853,000

° Estimated. † Without Alsace Lorraine since 1939.
‡ Includes Austrian production from 1938 to 1945. All occupied zones of Germany proper since September 1945. § Home islands only.



By LEON JAUDOIN
French Correspondent, STEEL

FRENCH Industry's Progress Hinges on Coal

Acute shortage of fuel and danger of inflation clouds economic outlook at opening of 1947. Unless conditions are corrected the nation's steel industry will be unable to regain its prewar status, to the detriment of dependent consuming lines

Huge dam at Genissiat, upper left, will harness the water power of the Rhone river in France to provide 400,000 kilowatts of electric power. Coffering and material handling equipment is supplied by Compagnie Francais Blaw-Knox

Diesel-powered trains are being built at the nationalized Renault automobile works on the outskirts of Paris, lower left. NEA photo

PARIS

FRENCH steel output during 1946 was dominated by the problem of coke supplies and, without doubt, considerably more steel would have been produced had larger quantities of coke been available. In any case, record outputs cannot be looked for at present because most iron and steelworks need repairs and renovating that could not be undertaken during the German occupation.

France is not in a position to manufacture all the metallurgical coke she requires. Present capacity is somewhat more than 3 million tons a year. The main additional sources of supply in 1946 were imports from Belgium and Luxemburg, the Saar and the Ruhr, the United States, Great Britain and Poland. It is planned to increase domestic coke production capacity by at least 50 per cent.

In the meantime an agreement has been made with Belgium who will make into coke 73,000 tons of American coal per month, thus making available to France about 55,000 tons of coke monthly.

France must import for all purposes some 25 million tons of coal; prior to the war the bulk of imports came from the Saar and Germany; this source is now inadequate. Present largest source of imports is the United States, which was only a small contributor before the war.

French steelworks also are experiencing a shortage of refractory bricks. Prewar supplies came mostly from Germany and Austria, but these have practically ceased. Scrap had been plentiful until the end of 1946, but the blast furnaces had bought large quantities to make up for the lack of coke and the heavier grades of scrap now have become scarce. Plenty of light weight scrap is available but there are not sufficient means of compressing and packing to allow its use in iron and steelmaking.

Despite all these difficulties iron and steel production has greatly increased in comparison with 1945 production, and the output has progressed consistently. The increase has been mainly for basic bessemer steel owing to shortage of scrap, refractory bricks and specialized manpower required for making open hearth steel. In general the blast furnace works have two furnaces in operation irrespective of the number they have available, but a start is being made to put a third furnace in operation in each works.

French exports are on a low scale and are mainly to keep contact with old customers in Switzerland, the Middle East, Norway and Portugal. For the whole year 1946 French exports of iron and steel products can be estimated at 140,000 tons. Imports, which totaled 615,000 tons in 1945, were only around 450,000 tons in 1946, the government having reduced its purchases on account of France's short dollar balances.

French iron and steel prices were increased substantially in August, the increase ranging from 25 to 40 per cent according to the product. In 1945 and up to the middle of 1946 the government was subsidizing the steelworks to allow them to carry on under the official policy of blocking wages and prices. The subsidy was on the basis of 40 per cent of the invoice for basic bessemer steel and 27 per cent for open-hearth steel. In July last year the government was compelled to allow a marked increase of wages and, at the same time withdrew the subsidies but allowed prices to be increased. However, it is claimed that the authorized increase is not sufficient to make up the higher costs of production due to higher wages and increased price of raw materials. The works are therefore operating on a narrow margin of profit, and this only because they are producing at the full capacity of available plant. The following is a list of prices prevailing at the end of 1946:

Industry in EUROPE

	(Per metric ton) Francs	Dollars
Foundry pig iron	3,300	$27.50
Merchant bars, basic bess.	6,400	53.53
Rails	7,883	65.70
Plates, o.h.	8,581	71.50
Medium sheets, o.h.	9,383	78.19
Wire rods, basic bess.	7,447	62.00

Export prices are somewhat higher than the above, and the state takes the difference.

(*Please turn to Page* 366)

Belgian Production Tending Upward Despite Shortages

BRUSSELS

LIKE all countries in western Europe, the Belgian iron and steel and metalworking industries are affected by the shortage of coal. In addition to her own output Belgium imports coal and a substantial tonnage comes from the United States, but strikes in the American coal mines have had some effect on deliveries. Various methods have been used to economize coal and coke as much as possible. For this purpose steelworks prefer to use the richer Swedish ores instead of minette ores from France and Luxemburg. A considerable use is also made of scrap which, as a result, has become scarce and more expensive; in some cases, steelworks will only accept orders if the consumer will supply scrap from his own stocks.

Shortage of coal remains acute despite the fact that the output of Belgian coal mines is increasing, having reached 16,839,000 metric tons in the first three quarters of 1946, against 10,502,230 tons in the corresponding period of 1945. During these same periods Belgium imported 3,018,824 tons of coal in 1946 and exported 634,106 tons. Output of coke during the first nine months of the year was 2,858,950 tons in 1946, against 1,244,820 tons in the nine months of 1945. In the first three quarters of 1946 Belgium imported 4,823,723 metric tons of iron ore, of which 1,094,862 tons came from Sweden and 3,337,050 tons from France.

The production of iron and steel in Belgium is progressing, despite strikes that took place in the coal mines and in certain industries, particularly at the end of June. At the end of September there were 30 blast furnaces in operation. The output of iron and steel during the first three quarters of the year was:

	Pig Iron	Steel Ingots	Steel Castings	Finished Steel
	(Metric Tons)			
First 3 Qtrs.				
1946	1,521,140	1,562,350	41,970	1,252,820
1945	410,000	352,990	22,430	366,390

Total exports of Belgian iron and steel in the first nine

(*Please turn to Page* 369)

STEEL EXPORTS T

Its supply p

By B. K. PRICE
Eastern Editor, STEEL

STEEL exports will expand in 1947 to the extent that increased production and easing in domestic demand permit.

Demand from foreign buyers is great and financing is adequate for the tonnage that can be moved this year and perhaps for some time to come. However, gold and dollar balances of foreign buyers have shrunk appreciably during the past year and this presents a real problem for long-term future.

Prospects for higher steel production lie in the hopes of fewer strikes in the steel and coal industries than occurred last year. While what the new year will bring in the way of labor disputes can be only conjecture, new legislative controls over labor union activities to which the new Congress is committed should make for fewer work stoppages which were so costly last year.

Also pointing to a more substantial movement abroad this year are signs that there will be at least a slight easing in pressure for steel at home. Even if finished steel production is no more than sustained at last year's rate, and this should require no special optimism, there should be a movement somewhat in excess of the estimated 3,500,000 net tons shipped abroad in 1946.

These signs developed early last year, when, as steel production moved at a high rate throughout the summer and early fall period, it became apparent that pipe lines were filling up in various products and that barring further disruptions, supply and demand by early spring might be brought into fair balance.

As it developed, there were further serious disruptions as a result of the second major soft coal strike within a period of relatively few months. However, steel producers had been making progress on their backlogs and were being aided in this by steel consumers who had begun revising their postwar programs on a more realistic and practical basis.

Although it cost the country many millions of dollars, the mine walkout ended in time for a fairly good resumption of steel output before the end of the year, and unless there are further important disruptions, such as might possibly develop in connection with pending steel labor contract negotiations, progress toward a balancing of domestic supply and demand in a number of steel products may not be long deferred.

However, there will be important exceptions, notably in the light flat-rolled products. Essentially peacetime items, these products will continue in excess demand both here and abroad for some time. The stringency may ease somewhat as the year progresses. By this spring, or a little earlier, new facilities may start coming into operation, which eventually will increase output in these various light flat items at least 20 per cent, to around 20 million net tons a year. Nevertheless, there admittedly will be a stringency in these products throughout 1947.

With demand last year for steel products generally well exceeding supply, leading producers were forced to ration their foreign, as well as domestic, shipments—with quotas, representing a given percentage of prewar shipments. Undoubtedly this manner of distribution will continue well into this year.

Foreign buyers were disappointed that they did not receive more from this country during the past year. But it was obvious that the United States was diverting from its own needs to give them even what they got.

While much depends upon the policies of the new Republican Congress, government export controls may be continued for some months. Even the Export Control Act, now scheduled to expire June 30, 1947, may be extended, if various items continue in critical supply. The Office of International Trade, Department of Commerce, which was assigned control over exports at the end of hostilities, is endeavoring to use this control, according to its officials, to speed domestic reconversion by limiting exportation of commodities essential to this end; and if conditions permit will abolish these controls even before the scheduled termination of the Export Control Act next June.

Currently, it is said, OIT is attempting further simplification of procedures and is continuing examination of commodities under control in order that items may be deleted as soon as justifiable. In its promotional effort, primary effort is given to the direction of foreign trade through commercial channels and for the protection of trade connections.

During the past year export licensing of steel has broadened rather than contracted. Requirements of the National Housing program in particular, the agricultural equipment manufacturers and certain railroad needs resulted in the curbing of a number of steel products for export. Late last summer, for instance, OIT, with the authorization of the Civilian Production Administration, placed restrictions on a number of items, including sheet bars, reinforcing steel, hot carbon bars, one inch and under, wire rods, skelp, hot and cold-rolled sheets, cold strip, angles, channels and beams, 6 inches and under, wire bale ties, certain descriptions of welded pipe and iron and steel pipe fittings.

Today, steel items which are free from specific licensing, such as wire rope and various alloy steels, are the exception to the rule, and no immediate modification in the list seems likely.

Commenting on this situation, one OIT official recently said: "Foreign trade is now hampered by scarcity of

S TO EXPAND
y permits

Foreign buyers await all steel United States is likely to be able to spare this year and have funds to pay for it. Export volume will depend on production and lessening in domestic pressure for steel. Trend toward return of foreign trade to private enterprise

Despite pressure for steel at home, considerable tonnages are moving abroad to aid in rehabilitating a war-devastated world

supply of many commodities. There has been substantial evidence that the removal of export controls of scarce commodities would result in legislative embargoes, which, in the judgment of Office of International Trade, would be more harmful to foreign trade than export controls, no matter how rigid."

However, there is a disposition on the part of government officials, as well as private interests, to get export trading back to a normal basis. This is to be seen in the liquidation of various foreign buying missions, with the State Department exerting influence in this direction. Today there are few such missions, and where licenses are granted for the movement of goods for their account, it is usually made clear that the goods must be moved through private channels of trade.

With foreign credits built up during the war now tapering, and tapering rapidly in some instances, foreign countries presumably will have to obtain funds largely through the International Bank for Reconstruction and Development or similar channels. However, private capital will fill an important link where there is reasonable assurance of ability to pay, as attested by recently concluded or pending negotiations with such countries as Norway, Denmark, Australia, Belgium and Holland.

Settlement of wartime lend-lease accounts, with one major exception, have been completed.

Recently, foreign buyers have been manifesting greater caution price-wise. Tonnage available for spot or nearby delivery usually is snapped up quickly, almost regardless of cost. But when it comes to negotiating for tonnage for shipment some months hence there is an increasing disposition to shop around, certainly to delay in the actual placing of orders.

Since the general decontrol of prices there has been a strongly buoyant tone to the steel export market. Certain mills at least have stepped up their foreign prices rather sharply. However, the attitude of most leading producers is to advance prices conservatively and thus build soundly for the time when export business will be of greater importance than it is at present.

Figures compiled by the American Iron & Steel Institute indicate steel producers during the first seven months exported at the rate of about 6 per cent of their finished steel shipments. The maritime strike checked the flow in late summer and early fall, when considerable tonnage was diverted under the circumstances to domestic needs; then later the November soft coal strike retarded foreign shipments. However, it is believed the overall average rate for the remaining five months of 1946 was fairly sustained.

Conservatively, some trade leaders estimate steel pro-

(*Please turn to Page* 370)

By WILLIAM M. ROONEY
News and Market Editor, STEEL

1946 DOMESTIC MARKET Summary

Production by steel and metalworking industries in 1946 high, despite losses due to strikes, material and labor shortages. Output records established for many civilian goods. Demand continues heavy as new year starts

NINETEEN-FORTY-SIX was a year of frustration and contradiction for the steel and metalworking industries. With the economy only partially freed of the chilling hand of government control for most of the year, and with organized labor forcing extravagant wage demands through strikes and work stoppages, production came in fits and starts all year long, while acute materials shortages added to manufacturers' troubles, making impossible attainment of projected operating schedules.

In spite of all the difficulties, however, remarkable progress in adjusting to postwar conditions was made, and some new peacetime production records were chalked up.

Practically full employment was achieved during the year, non-agricultural employment in November, last available figure, reaching 49 million, while the unemployment roll registered fewer than 2 million. Most of the returned war veterans were absorbed in industry, while displaced war workers found new jobs. Major plant reconversions were completed and the output of many civilian goods attained record levels.

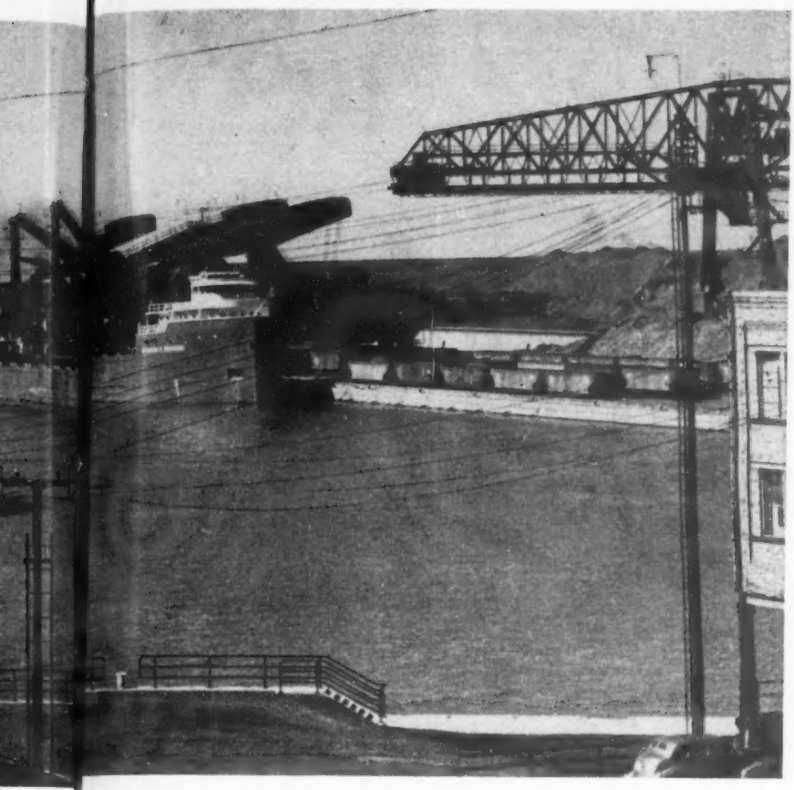
Steel production missed a new peacetime record by a narrow margin, and this only because of the yearend strike in the coal mines. 1946 output of steel ingots, December estimated, totaled about 66 million net tons, a figure topped only once previously in peacetime, in 1940 when 66,981,662 tons were turned out by the furnaces. Finished steel production for the year is estimated at about 46 million tons.

Actually, the year's showing in steel was remarkable considering the fact that the steel and coal strikes alone resulted in the loss of from 14 million to 15 million tons of ingots, equivalent to about 11 million tons of finished steel, from potential production. Had this steel been produced output would have exceeded the 79,701,624 tons of ingots produced in 1945, and would have gone far toward relieving the critical steel shortages which prevented full-scale manufacture of urgently needed civilian goods.

The steel tonnage lost through the strikes in the first 10 months of last year was estimated by the American Iron & Steel Institute as sufficient to build 900,000 automobiles and 70,000 farm tractors, plus 570,000 washing machines, 1,144,000 kitchen stoves, 1,416,000 refrigerators, and 7 billion tin cans. And there still would be left about 9 to 10 million tons for other consuming outlets.

Ingot operations for the year averaged about 72 per cent of capacity. This compares with 83.5 per cent in 1945. The furnace rate ranged from a low of 5 per cent of capacity in late January during the steel strike, to a high of 91.5 per cent in early November just prior to the yearend coal mine work stoppage.

Production of pig iron was sharply curtailed by the coal and steel strikes. Output for the year, November and December estimated, amounted to only about 45 million tons, which compares with 53,018,128 tons in 1945 and with 46,894,676 in 1940. Coke supply was inadequate to support maximum blast furnace operations, producers being forced to sharply reduce operations during the spring and winter coal strikes. As a result an acute shortage of pig



Despite a late start, ore and coal shipments on the Great Lakes were heavy last year. At left, the BENJAMIN F. FAIRLESS is being unloaded at Conneaut

iron prevailed throughout the year, not only adversely affecting steelmaking operations but holding back foundry activities as well.

Movement of iron ore from upper lake ports to lower lake docks and furnaces was maintained at a steady pace throughout the 1946 lake shipping season. However, the movement of ore was off sharply from 1945, totaling only 59,356,716 gross tons as against 75,714,750 in the 1945 season. This drop of 16,358,034 tons, however, was in line with projected plans for the 1946 season set in the spring. Some tonnage was lost due to the late opening of navigation because of a strike by ore miners. Stocks of ore at lower lake ports and furnaces at the end of the year were believed adequate to support blast furnace operations at a high level beyond the opening of lake navigation in the spring of 1947, total dock and furnace inventories being estimated at over 40 million tons. Allowing for consumption at the rate of 7 million tons monthly, stocks at the end of the year were sufficient to support furnace operations into May.

In addition to the handicaps to steel and iron production caused by strikes, output was hampered by shortages of scrap. Approximately 2 million tons of purchased scrap are required monthly to sustain capacity steel operations. With the drop in pig iron production because of the coal strikes, steelmakers sought to maintain open-hearth operations by increasing their scrap charges. Consequently, scrap inventories were depleted and with collections discouraged by the rigid price ceilings maintained by the Office of Price Administration, the supply situation had become so acute by midsummer the government was constrained to launch a salvage campaign patterned somewhat after those conducted so successfully during the war. However, this effort was not attended with much success, and not until well toward the close of the year after price controls were removed and scrap prices were advanced $2 to $5 per ton, did any sign appear of an improvement in the flow of material to the furnaces. This improvement, however, came late in the year when bad weather discourages collections, so that the steelmakers enter the new year with scrap inventories dragging bottom and prospects unpromising for any material relief before spring.

Probably the most spectacular feature of the government's latest scrap drive concerns a shipbreaking program which promises to provide substantial tonnages of material over the coming year. In November it was estimated something like 30,000 tons of scrap monthly were being derived from this program, and expectations are that by early 1940 the rate will be stepped up to 40,000 tons a month.

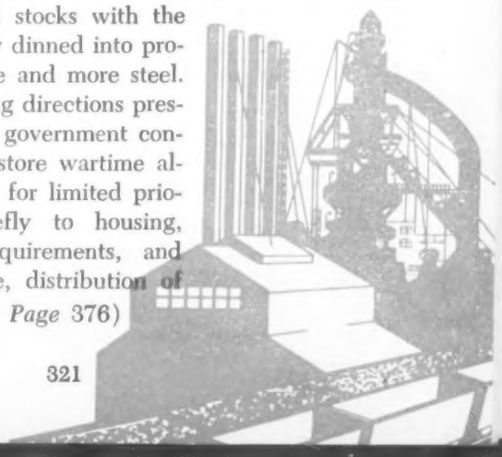
Two major strikes cut seriously into coal and coke production last year, one beginning Apr. 1 and lasting through May, and the second starting Nov. 20 and continuing through Dec. 7. In both instances, limited stocks of coal at by-product coke ovens forced sharp curtailment in coke production, which was promptly reflected in the banking of numerous blast furnaces. At the beginning of the spring coal mine strike the by-product ovens had about 36 days' supply of coal on hand, and at the start of the November walkout they had only about 23 days' supply.

The spring mine strike ended when the government took over operation of the mines and granted the striking miners a wage increase and other advantages. That work stoppage cost the nation an estimated loss of 81,549,272 tons of coal, while an aditional 27 million tons were lost in the November-December work stoppage which ended only after John L. Lewis and the miners' union were fined a total of $3,510,000 upon being found in contempt of court for failing to honor a temporary injunction ordering postponement of the strike pending judicial ruling on the merits of the government contract issue raised by Lewis.

Cumulative production of coal for the year through Dec. 14 amounted to 500,661,000 tons, which was 9.9 per cent below output in the comparable period of 1945. Cumulative production of by-product coke through October totaled 43,916,656 net tons compared with 52,058,800 in the like period of 1945. At the same time beehive coke output amounted to 3,614,895 tons against 4,452,500 in the preceding year.

Demand for steel was unusually pressing throughout 1946. At no time were producers able to keep pace with order volume with the result mill backlogs grew steadily. Shortages were so severe in some product categories, especially the flat rolled items, that many consumers were forced to shut down their plants from time to time pending receipt of mill shipments. No one was able to accumulate adequately balanced stocks with the cry being continually dinned into producers' ears for more and more steel. From some consuming directions pressure was exerted on government control authorities to restore wartime allocations, but except for limited priorities applying chiefly to housing, farm implement requirements, and some export tonnage, distribution of

(*Please turn to Page* 376)



Average Monthly Quotations in 1946

Base or Furnace, Unless Otherwise Specified; Scrap, Delivered to Consumers

PITTSBURGH

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Structural Shapes	2.10c	2.225c	2.35c	2.35c	2.35c	2.35c	2.35c	2.35c	2.35c	2.35c	2.35c	2.35c
Plates	2.25	2.375	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Bars	2.25	2.375	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	†2.55
Steel Bars, Cold-Finished	2.75	2.925	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.15
Strip, Hot-Rolled (over 6 to 12 inches)	2.10	2.225	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	†2.462
Strip, Cold-Rolled	2.80	2.925	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	†3.162
Standard Spikes	3.25	3.45	3.65	3.65	3.65	3.65	3.65	3.65	3.65	3.65	3.65	4.075
Plain Wire	2.75	2.90	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05	3.05
Structural Rivets	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	5.125
Sheets, Hot-Rolled	2.20	2.312	2.425	2.425	2.425	2.425	2.425	2.425	2.425	2.425	2.425	†2.481
Sheets, No. 24 Galvanized	3.70	3.875	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	†3.675
Tin Plate, base box	5.00	*5.125	*5.25	*5.25	*5.25	*5.25	*5.25	*5.25	*5.25	*5.25	*5.25	*5.25
Wire Nails	2.90	3.075	3.25	3.25	3.25	3.54	3.75	3.75	3.75	3.75	3.75	3.75
Steel Pipe, 1-3 inch, % discount (Base $200 per ton)	68½	67	65½	65½	65½	65½	65½	65½	65½	65½	65½	65½
Bessemer Pig Iron, Neville Island base	$26.25	$26.25	$26.625	$27.00	$27.00	$29.00	$29.00	$29.00	$29.00	$29.00	$29.00	$31.00
Basic Pig Iron, Neville Island base	25.25	25.25	25.625	26.00	26.00	28.00	28.00	28.00	28.00	28.00	28.00	30.00
No. 2 Foundry Pig Iron, Neville Island base	25.75	25.75	26.125	26.50	26.50	28.50	28.50	28.50	28.50	28.50	28.50	30.50
Malleable Pig Iron, Neville Island base	25.75	25.75	26.125	26.50	26.50	28.50	28.50	28.50	28.50	28.50	28.50	30.50
Bessemer Ferrosilicon, 10% (Jackson, O., base)	40.25	40.25	40.625	41.00	41.00	43.00	43.00	43.00	43.00	43.00	43.00	44.50
Billets, Bessemer and Open-Hearth	36.00	37.50	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00
Sheet Bars, Bessemer and Open-Hearth	36.00	37.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00
Wire Rods	2.15	2.225	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.425
Furnace Coke, spot	7.50	7.50	7.50	7.50	7.50	7.50	8.75	8.75	8.75	8.75	8.75	8.75
Foundry Coke, spot	8.25	8.25	8.25	8.25	8.25	8.25	9.50	9.50	9.50	9.50	9.50	9.50
Heavy Melting Steel Scrap	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	23.00	28.50
Low Phosphorous Scrap	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	23.75	22.50	25.50	30.69
No. 1 Cast Scrap	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	23.75	25.00	27.80	37.13

* Nominal; † Pricing basis changed during month.

CHICAGO

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Bars	2.25c	2.375c	2.50c	2.50c	2.50c	2.50c	2.50c	2.50c	2.50c	2.50c	2.50c	†2.55c
Plates	2.25	2.375	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Structural Shapes	2.10	2.225	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35
Rail Steel Bars	2.25	2.375	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	†2.55
Cold-Rolled Sheets	3.05	3.162	3.275	3.275	3.275	3.275	3.275	3.275	3.275	3.275	3.275	†3.218
No. 2 Foundry and Malleable Pig Iron	$25.75	$25.75	$26.125	$26.50	$26.50	$28.50	$28.50	$28.50	$28.50	$28.50	$28.50	$30.50
Charcoal Iron, Low Phosphorus, fob Lyles, Tenn.	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	33.00	37.50
Heavy Melting Steel Scrap	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	18.75	21.75	27.19
Rails for Rerolling	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25	22.25	24.25	31.00
No. 1 Machinery Cast Scrap	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	23.75	25.00	30.00	36.88

† Pricing basis changed during month.

EASTERN PENNSYLVANIA

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tank Plates, delivered Philadelphia	2.30c	2.425c	2.55c	2.55c	2.55c	2.55c	2.558c	2.558c	2.558c	2.558c	2.558c	2.558c
Structural Shapes, delivered Philadelphia	2.215	2.34	2.465	2.465	2.465	2.465	2.48	2.48	2.48	2.48	2.48	2.48
Steel Bars, delivered Philadelphia	2.57	2.695	2.82	2.82	2.82	2.82	2.86	2.86	2.86	2.86	2.86	†2.91
Hot-Rolled Sheets, delivered Philadelphia	2.37	2.482	2.595	2.595	2.595	2.595	2.615	2.615	2.615	2.615	2.615	†2.671
Basic Pig Iron, delivered	$27.09	$27.09	$27.09	$27.84	$27.84	$29.84	$29.93	$29.93	$29.93	$29.93	$29.93	$31.93
No. 2 Foundry Pig Iron, delivered Philadelphia	27.59	27.59	27.59	28.34	28.34	30.34	30.43	30.43	30.43	30.43	30.43	32.43
Standard Low Phosphorus Pig Iron, delivered	32.49	32.49	32.49	33.24	33.24	35.24	35.38	35.38	35.38	35.38	35.38	37.38
No. 1 Heavy Melting Scrap	$18.75	$18.75	$18.75	$18.75	$18.75	$18.75	$18.75	$18.75	$18.75	$18.75	$21.90	$27.38
No. 1 Cupola Cast Scrap	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	23.75	25.00	32.80	40.13
Spiegeleisen, 19-21%, Palmerton, Pa., base	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	37.60	40.00

† Pricing basis changed during month.

COAL TAR PRODUCTS

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Benzol, per gallon, producers' plants, tank lots	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c	15.00c
Toluol, two degree, per gallon, producers' plants, tank lots	28.00	28.00	27.00	27.00	27.00	27.00	27.00	22.00	22.00	22.00	22.00	22.00
Solvent naphtha, per gallon, producers' plants, tank lots	27.00	27.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
Xylol, per gallon, producers' plants, tank lots	27.00	27.00	26.00	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	22.00
Naphthalene, flakes and balls, per pound, producers' plants barrels to jobbers	8.00	8.00	8.00	8.00	8.00	8.00	8.00	9.00	9.00	9.00	9.00	9.00
Phenol, per pound, producers' plants less than car lots	13.25	13.25	11.25	11.25	11.25	11.25	11.25	12.00	12.00	12.00	12.00	12.00
Sulphate of ammonia, per ton, bulk, fob Atlantic Seaboard	$29.20	$29.20	$29.20	$29.20	$29.20	$29.20	$29.20	$30.00	$30.00	$30.00	$30.00	$30.00

NONFERROUS METALS

Prompt wholesale prices in cents per pound

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Tin, Straits, New York	52.000	52.000	52.000	52.000	52.000	52.000	52.000	52.000	52.000	52.000	64.761	70.000
Copper, electrolytic, delivered, Connecticut	12.000	12.000	12.000	12.000	12.000	14.280	14.375	14.375	14.375	14.375	17.231	19.500
Zinc, prime western, East St. Louis	8.250	8.250	8.250	8.250	8.250	8.250	9.240	8.250	8.250	8.865	10.120	10.500
Lead, open market, East St. Louis	6.350	6.350	6.350	6.350	6.350	8.030	9.100	8.100	8.100	8.100	10.287	12.014
Lead, open market, New York	6.500	6.500	6.500	6.500	6.500	8.180	9.250	8.250	8.250	8.250	10.437	12.190
Aluminum, 99 per cent plus	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000
Antimony, domestic, bulk, cl., fob Laredo, Tex.	14.500	14.500	14.500	14.500	14.500	14.500	14.500	14.500	14.500	14.500	20.880	25.780
Nickel, cathodes, contract prices including duty, fob refinery carloads	31.500	31.500	31.500	31.500	31.500	31.500	31.500	31.500	31.500	31.500	32.20	35.00

Pig Iron and Steel Ingot Production

Steel Ingot Figures by American Iron and Steel Institute. Coke Pig Iron by STEEL

Pig Iron Production

Net Tons

	Stacks No.	Stacks In	Output Total	Output Av. daily	Stacks No.	Stacks In	Output Total	Output Av. daily	Stacks No.	Stacks In	Output Total	Output Av. daily	Stacks No.	Stacks In	Output Total	Output Av. daily
			1929				1940				1941				**1942	
Jan.	328	202	3,844,991	124,031	233	177	4,024,556	129,825	229	205	4,666,233	150,524	...	...	5,061,380	.....
Feb.	326	208	3,604,581	128,735	233	157	3,304,368	113,943	229	202	4,206,826	150,244	...	...	4,578,629	.....
Mar.	326	213	4,154,660	134,021	233	152	3,270,575	105,502	229	205	4,702,905	151,707	...	...	5,134,009	.....
Apr.	326	216	4,102,747	136,759	233	155	3,139,043	104,635	229	191	4,340,555	144,685	...	...	4,974,960	.....
May	325	220	4,366,145	140,843	233	171	3,497,157	112,811	229	206	4,596,113	148,262	...	...	5,151,771	.....
June	325	220	4,160,917	138,697	232	181	3,813,092	127,103	229	211	4,551,040	151,701	...	...	5,014,062	.....
July	325	217	4,236,412	136,658	231	187	4,060,513	130,984	229	212	4,766,216	153,749	...	...	5,129,300	.....
Aug.	325	209	4,195,742	135,346	231	190	4,234,576	136,599	229	215	4,784,639	154,343	...	...	5,087,235	.....
Sept.	323	204	3,916,029	130,534	231	192	4,172,551	139,085	230	219	4,721,337	157,378	...	...	5,015,601	.....
Oct.	318	203	4,018,724	129,637	231	196	4,437,725	143,152	230	216	4,860,033	156,775	...	...	5,314,759	.....
Nov.	317	176	3,564,310	118,811	231	202	4,397,656	146,589	231	217	4,707,194	156,906	...	...	5,161,978	.....
Dec.	316	156	3,177,347	102,495	231	202	4,542,864	146,544	232	218	5,014,995	161,774	...	...	5,279,580	.....
Total			47,342,605	•129,705			46,894,676	•128,128	Total		55,918,086	153,200			60,903,304	.....
			**1943				**1944				**1945				**1946	
Jan.	...	..	5,194,245	.....	..	...	5,281,464	.....	...	...	4,945,018	.....	...	...	2,644,552	.....
Feb.	...	...	4,766,001	.....	...	...	5,088,013	.....	...	...	4,562,744	.....	...	...	1,147,564	.....
Mar.	...	...	5,314,201	.....	...	...	5,439,240	.....	...	...	5,227,790	.....	...	...	4,423,916	.....
Apr.	...	...	5,035,178	.....	...	...	5,248,410	.....	...	...	4,785,659	.....	...	...	3,613,560	.....
May	...	...	5,177,728	.....	...	...	5,347,866	.....	...	...	5,016,060	.....	...	...	2,274,545	.....
June	...	...	4,836,283	.....	...	...	5,061,621	.....	...	...	4,605,012	.....	..	...	3,682,273	.....
July	...	...	5,022,745	.....	...	...	5,161,814	.....	...	...	4,812,419	.....	..	...	4,705,277	.....
Aug.	...	...	5,314,633	.....	...	...	5,215,222	.....	...	..	4,248,547	.....	...	...	4,897,980	.....
Sept.	...	...	5,225,516	.....	...	...	4,992,883	.....	...	...	4,226,752	.....	...	...	4,687,390	.....
Oct.	...	...	5,323,738	.....	...	...	5,200,175	.....	...	...	3,388,127	.....	...	...	4,814,561	.....
Nov.	...	...	5,333,303	.....	...	...	5,425,591	.....	...	...	4,025,958	.....	...	...	4,434,711	.....
Dec.	...	...	5,212,918	.....	...	...	5,403,899	.....	...	...	4,322,996	.....	...	...	‡3,673,671	.....
Total			61,777,296	.....	...	...	62,866,198	.....	...	...	54,167,082	.....	...	...	‡45,000,000	.....

•Average. **Figures by American Iron and Steel Institute. ‡Estimated.

Steel Ingot Production and Operating Rates

Net Tons

	1929 Total	1929 Weekly Av.	% of Capacity	1940 Total	1940 Weekly Av.	% of Capacity	1941 Total	1941 Weekly Av.	% of Capacity	1942 Total	1942 Weekly Av.	% of Capacity
Jan.	5,040,147	1,137,731	86.84	5,764,723	1,301,292	83.4	6,922,352	1,562,608	96 8	7,112,106	1,605,442	94.5
Feb.	4,848,159	1,212,039	92.51	4,525,797	1,093,188	70.0	6,230,354	1,557,589	96.5	6,512,535	1,628,134	95.9
Mar.	5,676,357	1,281,345	97.80	4,389,183	990,786	63.5	7,124,003	1,608,127	99.6	7,392,111	1,668,648	98.2
Apr.	5,544,059	1,292,322	98.64	4,100,474	955,821	61.2	6,754,179	1,574,401	97.6	7,121,291	1,659,975	97.7
May	5,920,596	1,336,478	102.01	4,967,782	1,121,395	71.8	7,044,565	1,590,195	98.5	7,382,578	1,666,496	98.1
June	5,491,310	1,280,026	97.70	5,657,443	1,318,751	84.5	6,792,751	1,583,392	98.1	7,015,302	1,635,269	96.3
July	5,432,653	1,229,107	93.82	5,724,625	1,295,164	83.0	6,812,224	1,541,227	93.3	7,144,958	1,616,506	94.5
Aug.	5,531,776	1,247,708	95.31	6,186,383	1,396,475	89.5	6,997,494	1,579,570	95.6	7,227,655	1,631,525	95.4
Sept.	5,071,233	1,184,868	90.44	6,056,246	1,415,011	90.6	6,811,754	1,591,531	96.3	7,057,519	1,648,953	96.4
Oct.	5,078,445	1,146,376	87.50	6,644,542	1,499,897	96.1	7,236,068	1,633,424	98.9	7,579,514	1,710,951	100.0
Nov.	3,943,644	919,265	70.17	6,469,107	1,507,950	96.6	6,960,885	1,622,584	98.2	7,179,812	1,673,616	97.8
Dec.	3,251,373	735,605	56.15	6,495,357	1,469,538	94.1	7,150,315	1,617,718	97.9	7,304,540	1,652,611	96.6
Total	60,829,752	1,166,661	89.05	•66,981,662	1,281,210	82.1	•82,836,946	1,588,741	97.3	•86,029,921	1,649,979	96.8

	1943 Total	1943 Weekly Av.	% of Capacity	1944 Total	1944 Weekly Av.	% of Capacity	1945 Total	1945 Weekly Av.	% of Capacity	1946 Total	1946 Weekly Av.	% of Capacity
Jan.	7,424,522	1,675,964	96.8	7,592,603	1,713,906	95.7	7,204,312	1,626,256	88.8	3,872,054	874,053	49.8
Feb.	6,824,604	1,706,151	98.5	7,194,009	1,737,683	97.0	6,652,765	1,663,191	90.8	1,392,517	348,129	19.8
Mar.	7,674,578	1,732,410	100.0	7,826,257	1,766,649	98.6	7,705,929	1,739,487	95.0	6,507,047	1,468,859	83.3
Apr.	7,373,703	1,718,812	99.3	7,593,688	1,770,090	98.8	7,289,887	1,699,274	92.8	5,860,258	1,366,028	77.5
May	7,549,691	1,704,219	98.4	7,702,576	1,738,730	97.1	7,449,667	1,681,640	91.8	4,072,452	919,289	52.2
June	7,039,353	1,640,875	94.8	7,234,257	1,686,307	94.1	6,840,522	1,594,527	87.1	5,624,826	1,311,148	74.4
July	7,407,876	1,675,990	96.2	7,498,387	1,696,468	94.3	6,985,571	1,580,446	86.3	6,609,668	1,495,400	84 9
Aug.	7,586,464	1,712,520	98.3	7,498,913	1,692,757	94.1	5,735,317	1,294,654	70.7	6,886,863	1,554,597	88 2
Sept.	7,514,339	1,755,687	100.7	7,235,111	1,690,446	94.0	5,982,475	1,397,775	76.3	6,517,894	1,522,872	86.4
Oct.	7,814,117	1,763,909	101.2	7,620,885	1,720,290	95.6	5,596,776	1,263,381	69.0	6,909,597	1,559,728	88.5
Nov.	7,371,975	1,718,409	98.6	7,278,719	1,696,671	94.3	6,200,466	1,445,330	78.9	6,378,606	1,486,855	84.4
Dec.	7,255,144	1,641,435	94.2	7,366,170	1,666,554	92.6	6,057,937	1,370,574	74.8	‡5,365,218	.....	.....
Tot.	88,836,366	1,703,804	98.1	89,641,575	1,714,644	95.5	79,701,624	1,528,608	83.5	‡66,000,000	.....	.....

Compiled by American Iron & Steel Institute. Crucible and electric ingot production, excluded from the 1929 figures, totaled 1,073,045 tons in that year. Figures for 1940 and subsequent years include electric ingot and steel for castings production but exclude crucible steel output which totaled: 1024 tons in 1940; 2313 tons, 1941; 2010 tons, 1942; 146 tons, 1943; 25 tons, 1944. Figures for 1940 and subsequent years based on reports of companies which made 100 per cent of the bessemer and about 98 per cent of open hearth and 87 per cent of electric ingot and steel for castings production. Annual capacities as of Jan. 1, 1946, were as follows: Open hearth, 81,236,250 net tons; bessemer, 5,154,000; electric, 5,500,290; or a total of 91,890,540 net tons. ‡Estimated.

The Business Trend

Industry Seeking E

STEEL OUTPUT

AUTOMOBILES

By VANCE BELL
Associate Editor, STEEL

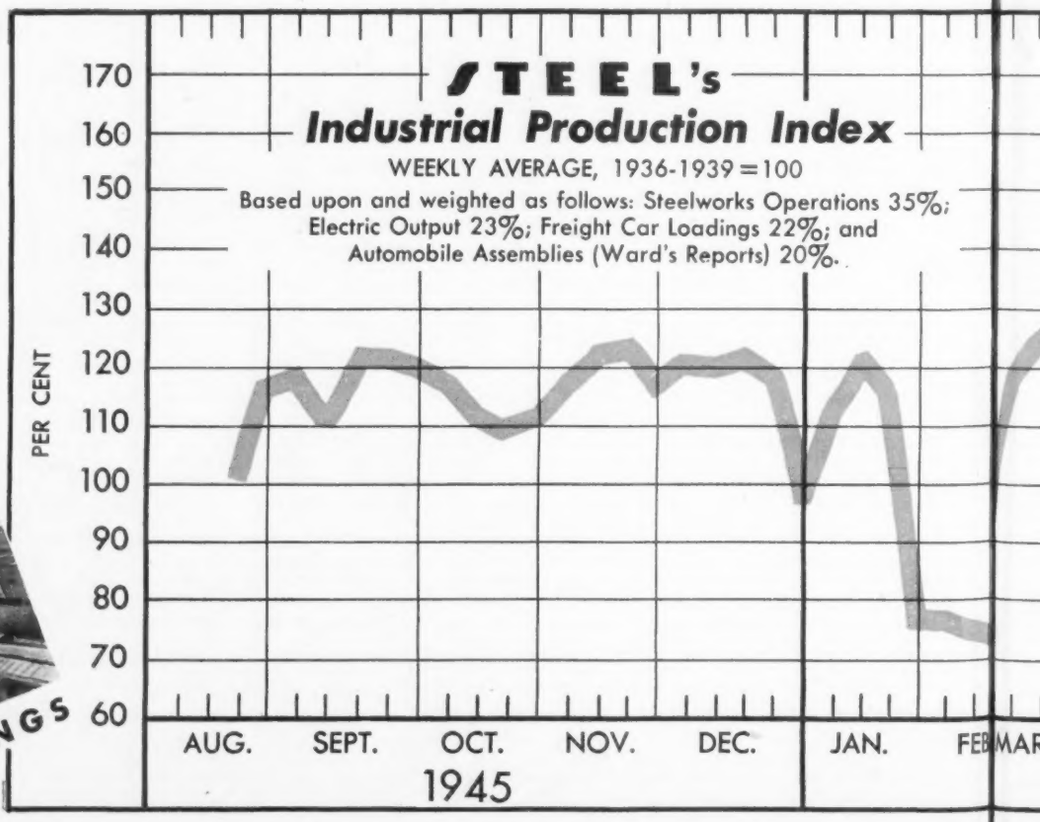
VIEWED in broad perspective, the year 1946 marked the beginning of a new economic cycle. For more than a decade the nation had been moving toward the left politically and economically. But last year signs appeared to indicate the pendulum was about to reverse its course.

Given initial impetus by the business depression of the '30s, the leftist trend was spurred on by the regimentation necessitated during more than four years' participation in war. During all of that time there was no holding back the floodtide of radical thinking, which, if left unbridled, would have eventually doomed the private enterprise system as we have known it in the past.

The stresses and strains accompanying complete conversion of the nation's production and distribution machinery from war to peace, brought the issue clearly into focus, and as the new year opens conservatism once again appears in ascendancy. Though many of the problems which plagued the economy all through 1946 remain to be solved, there is little question that constructive forces are at work in support of sounder, and more realistic social and economic national policies than have prevailed in recent years. With the new year business and industry enter a new phase, removal of practically all wartime con-

ELECTRIC OUTPUT

CAR LOADINGS



Economic Balance

Liquidation of many of government's wartime controls throws additional freedom and responsibility to private business in restoring of equilibrium to the nation's economy

trols making possible the free movement of economic forces for the first time in over five years.

Restoration of balance between costs, prices, and incomes is one of the biggest tasks facing the nation.

With practically all technical and mechanical reconversion from war to peacetime production completed in 1946, business finds it necessary to concentrate its energies toward fighting inflation.

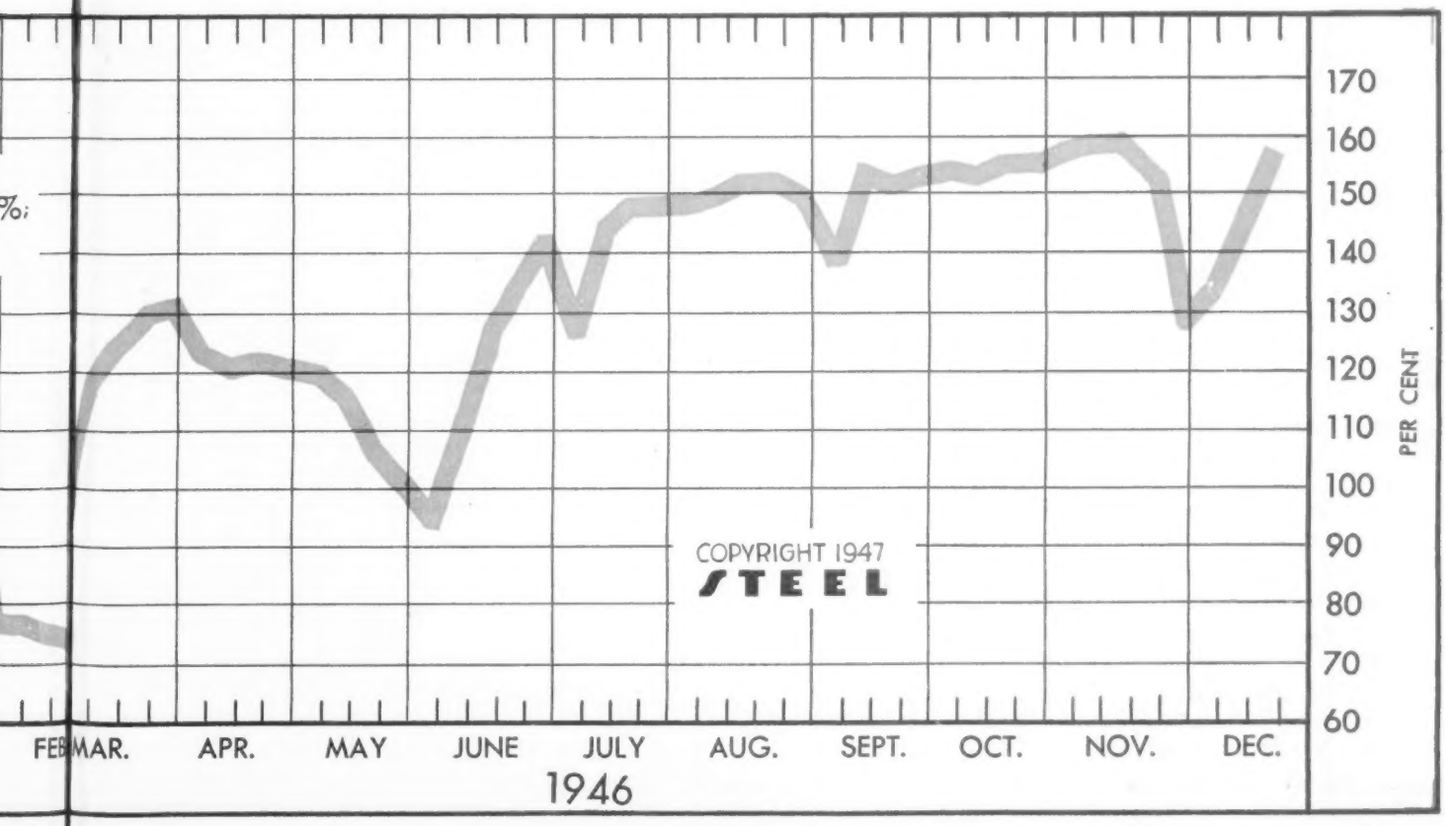
As an aftermath of war, shortages of materials, pent-up demand and discontentment of labor served to unbalance supplies, which in turn were conducive to spiralling of costs and prices.

Carried far enough, this inflationary movement could metamorphose into deflation, inasmuch as an uncurbed rise in prices would cut volume of purchases, in turn resulting in declining employment with serious repercussions on the nation's economy.

Prices have risen but manufacturers as a general rule have exercised restraint in effecting adjustments. In fact, some interests continued to operate at a loss throughout the year despite higher prices, basing their hopes for succor on increased productivity and volume production.

Among the postwar readjustments standing out prominently in 1946 was the break in the stock market in early September, following a downtrend that developed after the Dow-Jones industrial average hit a daily closing peak of 212.50 at the end of May. In its fluctuations after the sharp decline, the industrial average sank to a low daily closing of 163.12 in the first half of October.

Despite all difficulties encountered in 1946, industry set many new postwar as well as many peacetime production records. The steel industry, for example, produced about 66 million tons of steel, close to the peacetime record set in 1940. This high rate of production was a major factor in pushing STEEL's industrial production index to new postwar high marks. Except during the steel strike and during the two coal strikes, steel production held consistently at high levels. In November STEEL's industrial



index hit the postwar high of 158 per cent of the 1936-1939 average of 100 per cent, largely reflecting the booming steel production rate.

Although this peak of 158 was considerably above the highest postwar point (124) attained in 1945, the low mark of 74 in 1946 was far under the low of 98 in the preceding year. The low of 74 in February, 1946, was occasioned by the steelworkers' strike. Coal strikes cut STEEL's industrial production index to 94 in the early summer and to 127 at the end of November. However, despite the strike the index at the close of the year had returned to approximately the postwar peak.

Large order backlogs at the close of 1946 assure high level industrial operations well into 1947. The U. S. Commerce Department's order index was generally on the upgrade throughout 1946 and in September hit an all-time high on civilian goods. The sharpest increase, however, came in the durable goods industries, and improvement was shown in nondurable items also.

Trend of the Federal Reserve Board's industrial production index was similar to that of STEEL's index. In January this registered 160 per cent of the 1936-1939 average of 100, but dropped to 152 in February due to the steel strike. After rising to 168 in March it dropped to 165 in April and thence to 160 in May, largely because of the spring coal strike. After that, it rose steadily until it reached a new peacetime high of 182 for November.

Electricity Output Sets New Record

High level industrial activity carried electricity production upward in 1946 and established a new alltime output record of 4,777,943,000 kilowatt-hours in the week ended Dec. 14. Power consumption virtually taxed capacity of many electric utility companies. This tight supply-demand situation is expected to continue for two years, though the utilities are hopeful they can obtain new generating equipment in step with expanding consumer requirements.

Much of the pressure for steel in 1946 came from the automobile industry which, despite many obstacles, got production up in the last half of the year to 80,000 to 97,000 cars a week. In prewar years, production of 100,000 cars weekly was considered good. However, despite the substantial output scored during the closing weeks of 1946, the year's automobile production record was disappointing, total output of cars falling far below the industry's early-year projections.

High plane of industrial production brought about phenomenally high levels of railroad freight car loadings, these in some of the weeks late in 1946 exceeding 900,000 and surpassing even the peak wartime weekly loading figure. At the time when car loadings were running highest in 1946 the railroads were confronted with a decrease in the number of serviceable freight cars. For instance, on Oct. 1, 1946, they had but 1,672,474 serviceable cars, whereas on Oct. 1, 1945, they had 1,694,654 and on Oct. 1, 1944, they had 1,706,398. More than half of the cars owned in 1946 were more than 20 years old. Replacement of this rolling stock was handicapped by materials shortages which held freight car production below capacity, and also by a worsening of the railroads' financial position as a result of a substantial increase in operating costs.

While the railroads and all other industries and businesses saw their costs going up their employees also felt the effects of inflation as the cost of living rose. When 1946 opened, the U. S. Bureau of Labor Statistics cost-of-living index stood at 129.9 per cent of the 1935-1939 average of 100 but by the first of November had risen to 148.4 per cent.

While in some instances higher costs of living inspired buyer resistance they were not sufficient to cut dollar volume of department store sales, although part of the increased volume represented higher prices. In each of the first ten months of 1946, the index of department store sales was considerably above that for the corresponding month in 1945.

Despite the heavy sales volume, stores as well as most other businesses and industries were viewing the future with increasing caution by the end of 1946 and were watching inventories carefully. With respect to the value of stocks those held by manufacturers reached new high levels last year, although part of the increase reflected higher prices. Inventories demanded increased attention as supply conditions began to improve with prices tending upward. In reaching new levels of value, manufacturers' inventories rose steadily through the first ten months of 1946, and by the end of October total value in all stages of fabrication reached $19,553,000,000. A substantial portion of the increase resulted from inflated dollar values and from imbalances brought about by the piling up of abundant materials which could not be used for want of materials in short supply.

High level industrial activity in 1946 necessitated employment of increasing numbers of workers. U. S. Department of Labor figures show that except in the February steel strike the number of employees in manufacturing industries rose steadily through the first ten months of 1946. In January, 1946, 13,236,000 people were engaged in factory employment, while by the first of November there were 14,807,000. In the steel industry, employment hit a new all-time high mark of 595,700 in September and October.

Good Demand for Machinery Prevails

Demand for new manufacturing equipment, including machine tools, kept pace with the expansion in industrial activity. Machine tool shipments were far lower than during wartime but they were considerably above those in many prewar years. Shipments in the first ten months of 1946 averaged $27,078,272 a month. As to 1947, the outlook for a good level of machine tool shipments appears promising. Materials shortages are expected to diminish, permitting manufacturing programs to proceed at an increasingly satisfactory pace, and government surplus stocks are likely to be less competitive with sales of new equipment. While labor's demands for additional wage increases may bring on strikes those very demands may stimulate plant mechanization, this in turn generating demand for machine tools.

If industry as a whole is to operate at a high level over the long term it will have to keep production costs down. Already many companies are looking to the day when the big backlog of pent-up demand will have been satisfied

and when industrial operations will have to depend on currently generated volume. In preparation for this period, some companies have been exerting efforts to re-establish and preserve their export trade.

Return of peace brought an increase in new businesses but along with this trend came a rise in business failures, which in 1946 ran about 33 per cent ahead of those in 1945.

However, the construction industry is a source of optimism. It was anticipated by the F. W. Dodge Corp., New York, that total construction in 1947 would exceed $9.5 billion, compared with $7.7 billion in 1946.

Difficulty in obtaining materials and labor in 1946 caused postponement of a considerable amount of construction, much of which will emerge as soon as possible unless construction costs continue to rise so rapidly many planned projects are priced out of the market.

With government controls for the most part lifted the new year will mark the first time in five years that private enterprise has had a relatively free hand to determine its fate. This renaissance of economic freedom is being accompanied by some ponderous problems, a principal one being the need for a new balance in economic relationships that will permit trade and production to go forward at the maximum rate of which our system is capable.

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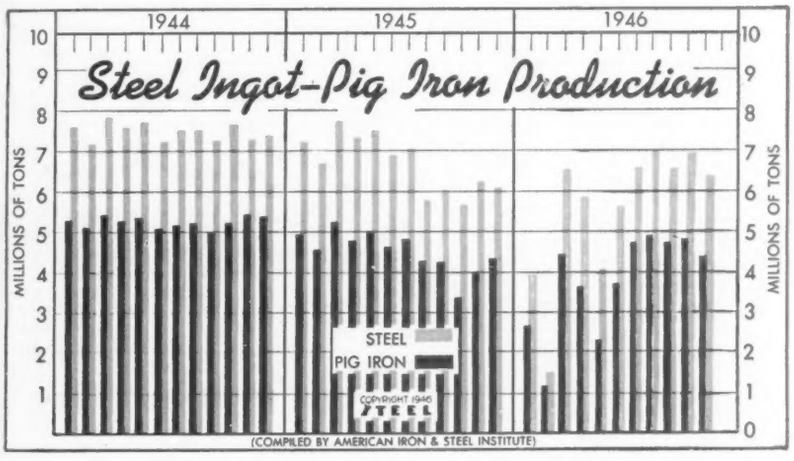
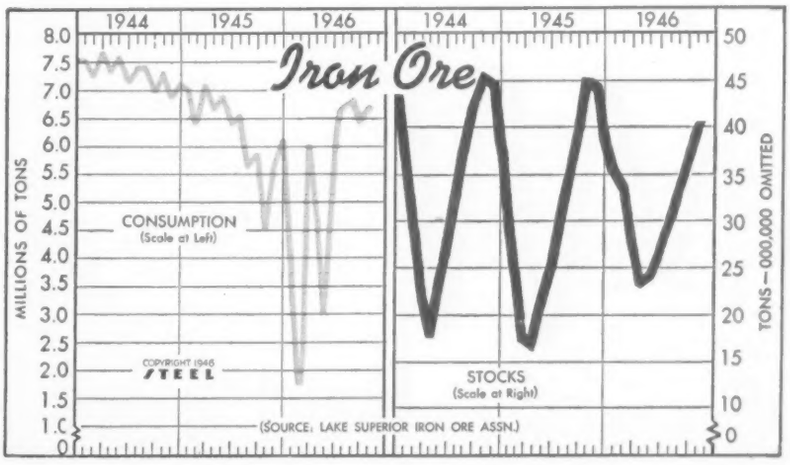


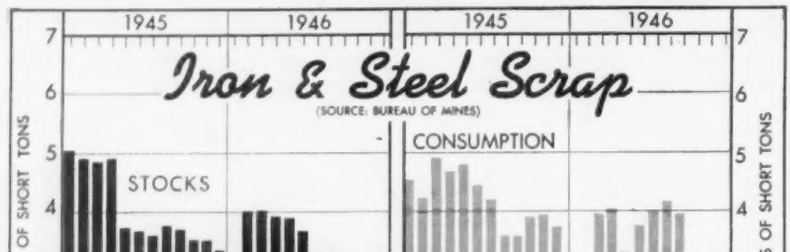
Iron, Steel Production
(Net Tons—000 omitted)

	Steel Ingots			Pig Iron	
	1946	1945	1944	1946	1945
Jan.	3,872	7,206	7,593	2,645	4,945
Feb.	1,393	6,655	7,194	1,148	4,563
Mar.	6,507	7,708	7,826	4,424	5,228
Apr.	5,860	7,292	7,594	3,614	4,786
May	4,072	7,452	7,703	2,275	5,016
June	5,624	6,842	7,234	3,682	4,605
July	6,610	6,987	7,498	4,705	4,812
Aug.	6,887	5,736	7,499	4,898	4,249
Sept.	6,518	5,983	7,235	4,687	4,227
Oct.	6,910	5,598	7,621	4,815	3,388
Nov.	6,379	6,201	7,279	4,435	4,026
Dec.	....	6,059	7,366	....	4,323
Total	....	79,719	89,642	....	54,167

Iron Ore
(Lake Superior Iron Ore Assn.)
Gross tons—000 omitted

	Consumption		Stocks at Lake Erie Docks and furnaces	
	1946	1945	1946	1945
Jan.	3,719	6,983	35,342	30,889
Feb.	1,748	6,371	33,647	24,577
Mar.	6,021	7,082	27,601	17,304
Apr.	4,769	6,642	23,079	16,429
May	2,990	6,872	23,905	20,715
June	4,995	6,397	26,265	24,847
July	6,460	6,532	30,439	29,485
Aug.	6,738	5,658	34,067	34,781
Sept.	6,380	5,837	37,573	39,549
Oct.	6,625	4,491	40,435	45,090
Nov.	....	5,611	.....	44,706
Dec.	....	6,099	.....	39,059
Total	....	74,576	.....	.....





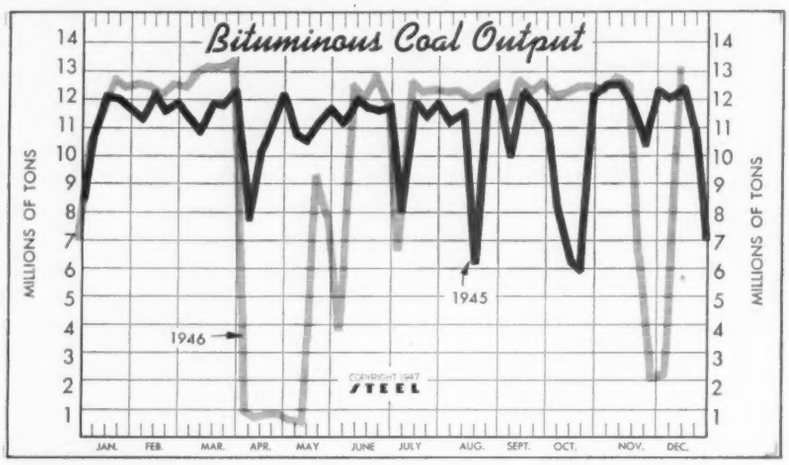
Iron and Steel Scrap
Bureau of Mines
(Gross Tons—000 omitted)

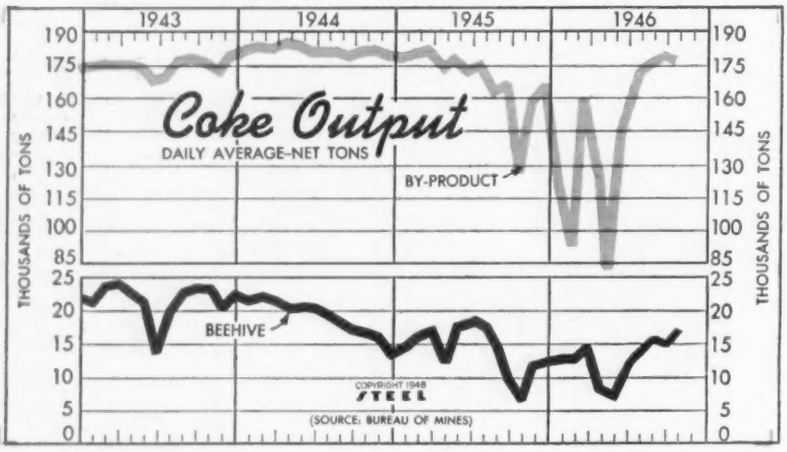
	Consumers' Stocks			Total Consumption		
	1946	1945	1944	1946	1945	1944
Jan.	†	5,023	6,214	*2,026	4,507	4,616
Feb.	4,010	4,901	6,134	*2,026	4,209	4,414
Mar.	4,031	4,873	6,027	3,942	4,889	4,827
Apr.	3,933	4,907	5,932	4,021	4,668	4,629
May	3,911	4,902	5,966	3,270	4,774	4,683
June	3,670	4,847	5,991	3,763	4,414	4,460
July	3,268	4,762	5,909	3,997	4,184	4,423
Aug.	2,968	4,848	5,975	4,170	3,562	4,533
Sept.	2,909	4,708	5,953	3,973	3,567	4,471
Oct.	....	3,527	5,832	....	3,867	4,684
Nov.	....	3,520	5,624	....	3,909	4,527
Dec.	....	3,341	5,335	....	3,687	4,487

† Data not available. * Figures for January and February, 1946, are merely averages derived from a report that combined these two strike-affected months.

Bituminous Coal Output
(Millions of Tons)
1946—By Weeks

Jan.	5	10.3	May 4	0.5	Sept. 7	11.2
Jan.	12	11.5	May 11	0.5	Sept. 14	12.7
Jan.	19	12.8	May 18	9.3	Sept. 21	12.3
Jan.	26	12.5	May 25	7.9	Sept. 28	12.6
Feb.	2	12.6	June 1	3.7	Oct. 5	12.1
Feb.	9	12.5	June 8	12.6	Oct. 12	12.2
Feb.	16	12.2	June 15	12.1	Oct. 19	12.5
Feb.	23	12.6	June 22	12.9	Oct. 26	12.5
Mar.	2	12.5	June 29	11.9	Nov. 2	12.4
Mar.	9	13.0	July 6	6.6	Nov. 9	12.8
Mar.	16	13.2	July 13	12.7	Nov. 16	12.5
Mar.	23	13.2	July 20	12.3	Nov. 23	6.4
Mar.	30	13.3	July 27	12.4	Nov. 30	2.0
Apr.	6	0.8	Aug. 3	12.3	Dec. 7	2.2
Apr.	13	0.6	Aug. 10	12.3	Dec. 14	13.2
Apr.	20	0.7	Aug. 17	12.0	Dec. 21	...
Apr.	27	0.7	Aug. 24	12.2	Dec. 28	...
			Aug. 31	12.5		





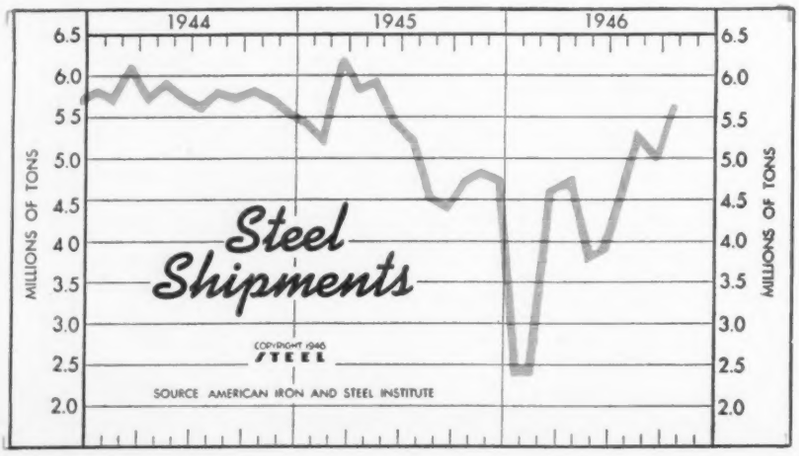
Coke Output
Bureau of Mines
(Daily Average—Net Tons)

	By-Product		Beehive	
	1946	1945	1946	1945
Jan.	122,570	179,879	13,069	14,745
Feb.	93,985	180,727	13,064	16,210
Mar.	161,290	182,120	14,897	17,115
Apr.	128,394	174,239	811	12,554
May	83,019	178,338	708	17,963
June	147,272	172,201	12,193	18,616
July	171,703	175,163	14,831	17,682
Aug.	176,195	163,567	16,317	14,669
Sept.	178,156	166,559	15,585	9,924
Oct.	177,817	127,173	17,322	6,407
Nov.	.....	159,646	.....	12,218
Dec.	.....	166,648	.....	12,659
Ave.	.....	168,855	.....	14,230

Steel Shipments
(Net Tons)

	1946	1945	1944
Jan.	2,391,850*	5,435,647	5,767,687
Feb.	2,391,849*	5,184,498	5,700,673
Mar.	4,644,988	6,179,452	6,146,595
Apr.	4,698,081	5,769,786	5,744,177
May	3,906,064	5,938,055	5,859,786
June	3,966,628	5,437,206	5,703,314
July	4,639,610	5,214,074	5,597,631
Aug.	5,406,470	4,512,637	5,837,328
Sept.	4,994,377	4,391,143	5,743,437
Oct.	5,675,339	4,660,237	5,752,147
Nov.	.....	4,779,628	5,686,527
Dec.	.....	4,729,561	5,458,133

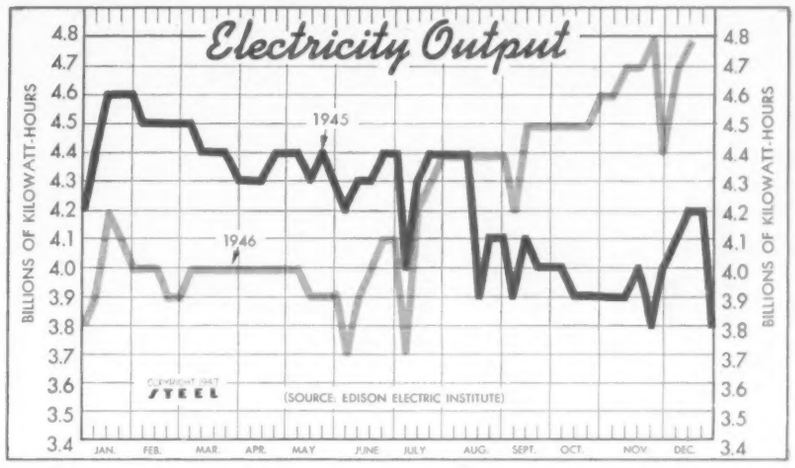
* Figures for January and February, 1946, are merely averages derived from a report that combined shipments for those two strike-affected months into a total of 4,783,699 tons.

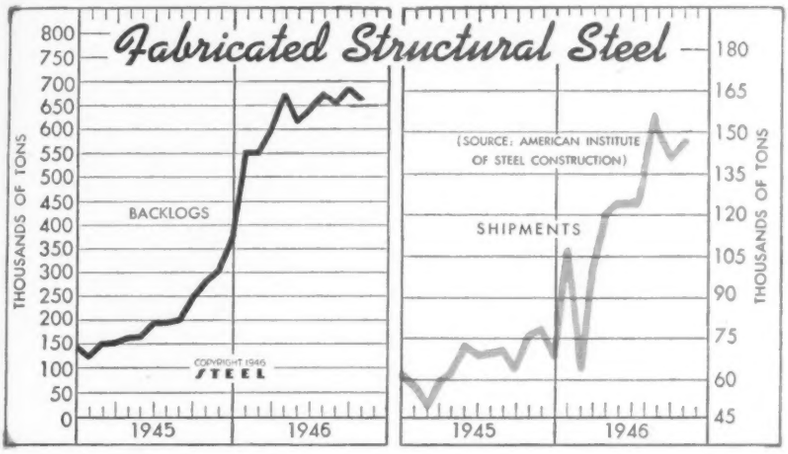


Electricity Output

(Millions of kilowatt-hours)
1946—By Weeks

Jan.	5	3,865	May	4	4,012	Sept.	7	4,184
Jan.	12	4,163	May	11	3,911	Sept.	14	4,521
Jan.	19	4,145	May	18	3,939	Sept.	21	4,507
Jan.	26	4,034	May	25	3,942	Sept.	28	4,518
Feb.	2	3,983	June	1	3,741	Oct.	5	4,478
Feb.	9	3,983	June	8	3,920	Oct.	12	4,495
Feb.	16	3,949	June	15	4,030	Oct.	19	4,540
Feb.	23	3,923	June	22	4,129	Oct.	26	4,602
Mar.	2	4,000	June	29	4,133	Nov.	2	4,628
Mar.	9	3,953	July	6	3,741	Nov.	9	4,682
Mar.	16	3,988	July	13	4,156	Nov.	16	4,700
Mar.	23	4,017	July	20	4,296	Nov.	23	4,765
Mar.	30	3,992	July	27	4,352	Nov.	30	4,448
Apr.	6	3,988	Aug.	3	4,351	Dec.	7	4,673
Apr.	13	4,015	Aug.	10	4,412	Dec.	14	4,778
Apr.	20	3,987	Aug.	17	4,422	Dec.	21	....
Apr.	27	3,977	Aug.	24	4,444	Dec.	28	....
			Aug.	31	4,404			





Fabricated Structural Steel

(000 Tons)

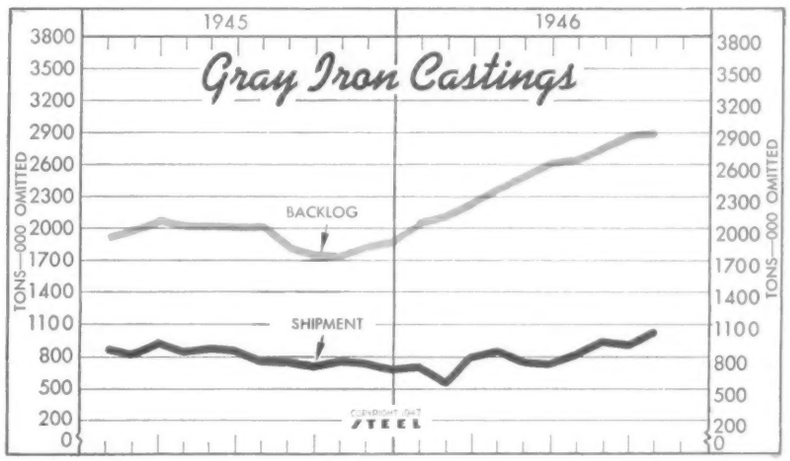
	Shipments			Backlogs		
	1946	1945	1944	1946	1945	1944
Jan.	107.5	57.0	35.2	552	124.4	113.1
Feb.	63.8	49.0	42.9	551	151.6	117.6
Mar.	102.8	59.5	41.4	605	153.3	106.3
Apr.	122.5	62.8	44.5	674	162.5	111.2
May	124.4	72.6	50.7	615	165.7	116.3
June	126.8	69.2	43.0	642	195.2	122.7
July	140.2	69.9	45.3	674	194.0	125.4
Aug.	157.5	70.6	55.2	651	201.1	130.4
Sept.	141.9	63.4	57.5	682	248.5	151.1
Oct.	149.3	76.6	61.6	660	282.8	174.4
Nov.	....	78.0	59.4	...	304.9	184.2
Dec.	....	68.8	61.3	...	375.2	142.5
Total	....	797.4	597.9	...	....	....

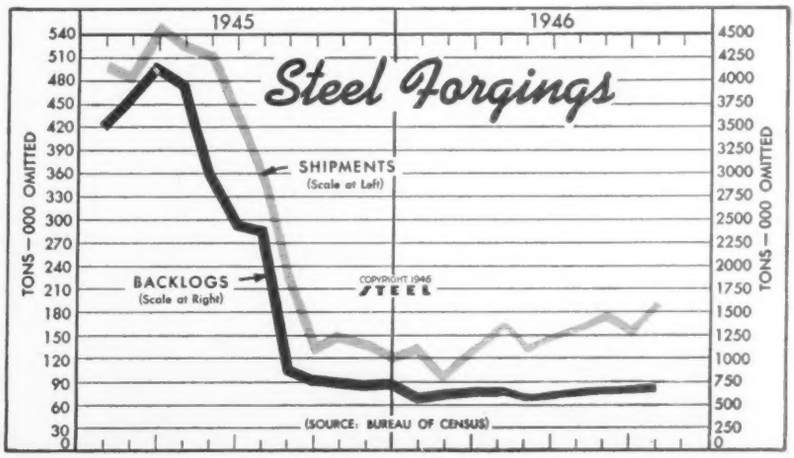
Gray Iron Castings

(U. S. Bureau of Census)
Tons—000 omitted

	Shipments		Backlogs*	
	1946	1945	1946	1945
Jan.	706	862	2,077	1,922
Feb.	541	816	2,153	1,998
Mar.	796	928	2,265	2,089
Apr.	857	843	2,378	2,032
May	757	867	2,492	2,031
June	735	849	2,633	2,016
July	811	749	2,669	2,015
Aug.	945	750	2,786	1,818
Sept.	914	718	2,882	1,755
Oct.	1,051	767	2,916	1,742
Nov.	....	751	....	1,847
Dec.	....	678	....	1,877
Mo. Ave.	....	798	....	1,928

*Unfilled orders for sale to the trade.



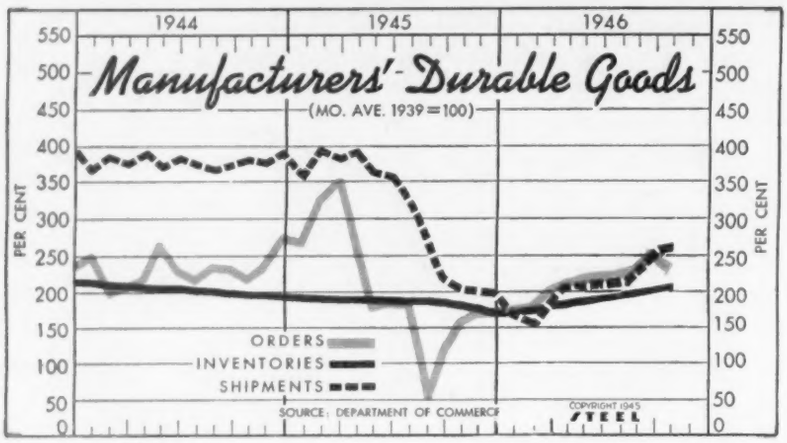


Steel Forgings

Tons—000 omitted

	Shipments		Unfilled orders*		Consumption of steel	
	1946	1945	1946	1945	1946	1945
Jan.	130	498	561	3,502	182	644
Feb.	93	483	596	3,826	125	628
Mar.	123	549	612	4,139	164	718
Apr.	155	524	604	3,961	208	666
May	139	510	599	2,989	197	655
June	147	430	610	2,420	204	548
July	154	345	624	2,356	214	438
Aug.	171	227	639	841	243	293
Sept.	162	126	648	745	233	172
Oct.	189	145	707	735	271	197
Nov.	...	...	135	...	708	...	185
Dec.	...	...	119	...	724	...	156

*Forgings for sale.

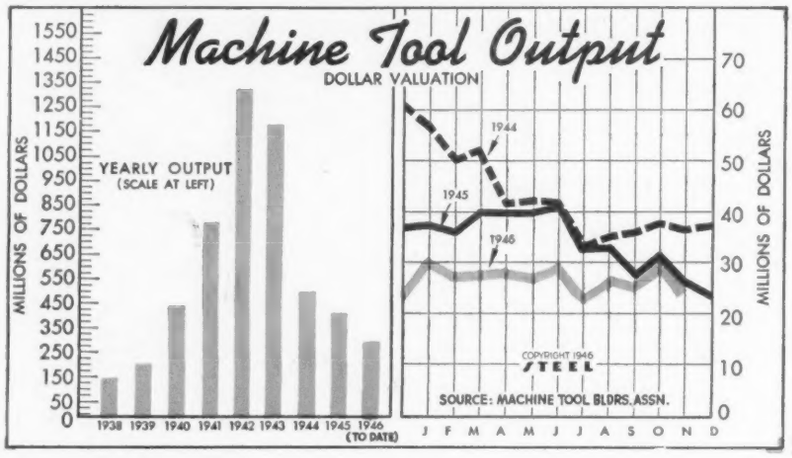


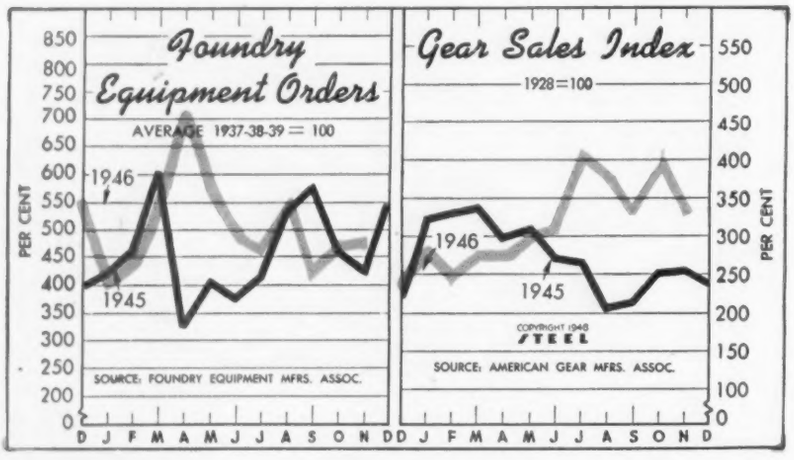
Index of Manufacturers' Durable Goods
(Mo. Ave. 1939 = 100)

	Orders		Shipments		Inventories	
	1946	1945	1946	1945	1946	1945
Jan.	176	267	169	354	171	190
Feb.	179	326	153	394	174	189
Mar.	203	351	183	382	181	189
Apr.	219	267	203	389	182	189
May	224	177	207	361	184	189
June	231	182	212	356	189	189
July	229	179	216	320	195	187
Aug.	232	53	233	262	200	185
Sept.	254	121	261	216	205	185
Oct.	246	160	265	203	211	182
Nov.	...	171	...	200	...	177
Dec.	...	172	...	199	...	171
Ave.	...	202	...	303	...	185

Machine Tool Shipments
(000 omitted)

	1946	1945	1944	1943
Jan.	$30,263	$37,353	$56,363	$117,384
Feb.	26,949	36,018	50,138	114,594
Mar.	27,326	40,045	51,907	125,445
Apr.	28,108	40,170	41,370	118,024
May	26,580	39,825	41,819	113,859
June	28,580	41,040	41,471	108,736
July	22,360	32,504	32,753	97,541
Aug.	26,911	32,500	35,177	87,805
Sept.	25,468	27,300	35,889	85,842
Oct.	29,140	31,200	37,516	78,302
Nov.	26,176	26,000	36,277	71,811
Dec.	.....	23,200	36,784	60,873
Total	.....	$407,155	$497,464	$1,180,216



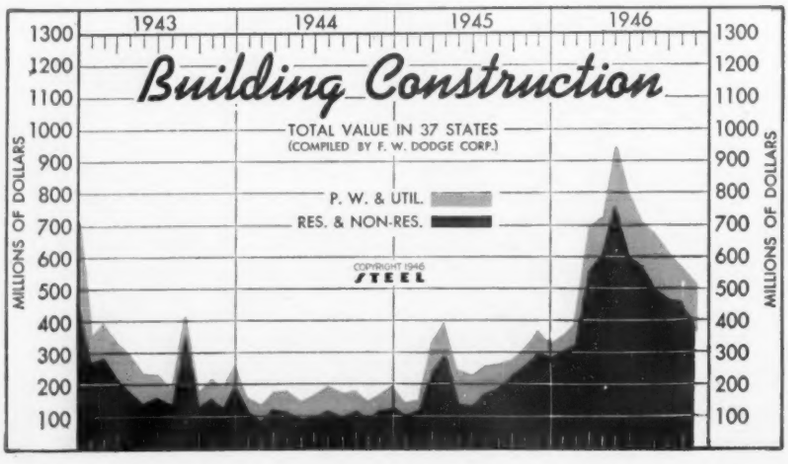


Foundry Equipment Orders and Gear Sales

	Foundry Equipment Orders —Index— (1937-38-39=100)			Gear Sales —Index— (1928=100)		
	1946	1945	1944	1946	1945	1944
Jan.	392.8	422.4	378.3	269	323	246
Feb.	432.8	465.3	456.8	253	331	214
Mar.	536.6	604.7	498.4	275	339	485
Apr.	701.2	325.0	385.7	284	296	308
May	577.3	404.7	503.9	313	309	305
June	491.7	375.4	466.1	321	271	328
July	453.4	411.7	375.8	407	264	242
Aug.	538.7	532.2	450.5	368	205	247
Sept.	424.4	577.2	388.0	342	213	248
Oct.	469.2	457.8	526.5	397	251	293
Nov.	477.4	416.6	369.5	336	255	209
Dec.	....	547.6	397.4	...	239	219
Ave.	....	461.7	433.1	...	275	279

Construction Valuation in 37 States
(Unit—$1,000,000)

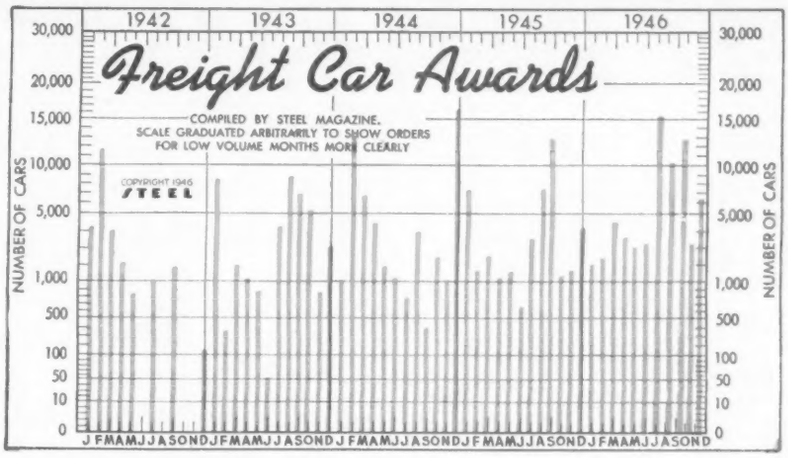
	Total	Public Works-Utilities		Residential and Non-residential	
	1946	1946	1945	1946	1945
Jan.	357.5	50.2	39.8	307.3	101.2
Feb.	387.4	64.7	32.0	322.7	115.0
Mar.	697.6	143.6	90.6	554.0	238.3
Apr.	734.9	128.1	111.9	606.8	283.9
May	952.4	197.9	107.9	754.6	134.6
June	807.9	202.5	95.0	605.5	132.3
July	718.0	153.1	89.9	564.9	167.8
Aug.	679.9	184.4	77.5	495.6	186.1
Sept.	619.9	156.4	54.6	463.5	223.6
Oct.	573.2	112.8	61.1	460.4	255.5
Nov.	503.7	121.8	74.0	382.0	296.0
Dec.	....	....	51.0	....	279.7
Total	....	....	885.3	....	2,414.0

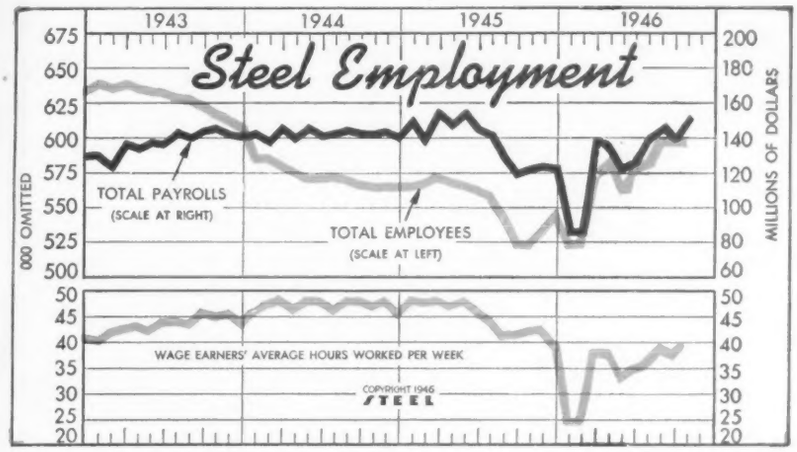


Freight Car Awards

	*1946	1945	1944	1943
Jan.	2,050	7,200	1,020	8,365
Feb.	2,403	1,750	13,240	850
Mar.	4,516	2,500	6,510	1,935
Apr.	8,764	1,120	4,519	1,000
May	8,025	1,526	1,952	870
June	8,334	670	1,150	50
July	15,236	3,500	795	4,190
Aug.	9,530	7,240	3,900	8,747
Sept.	12,737	12,840	400	6,820
Oct.	3,407	1,320	2,425	5,258
Nov.	6,705	1,650	1,065	870
Dec.	.....	4,116	16,245	2,919
Total	.....	45,432	53,221	41,374

* American Railway Car Institute.


Freight Car Awards
1942
1943
1944
1945
1946
COMPILED BY STEEL MAGAZINE.
SCALE GRADUATED ARBITRARILY TO SHOW ORDERS FOR LOW VOLUME MONTHS MORE CLEARLY
COPYRIGHT 1946 STEEL
NUMBER OF CARS
30,000
20,000
15,000
10,000
5,000
1,000
500
100
50
10
0
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D



Steel Employment

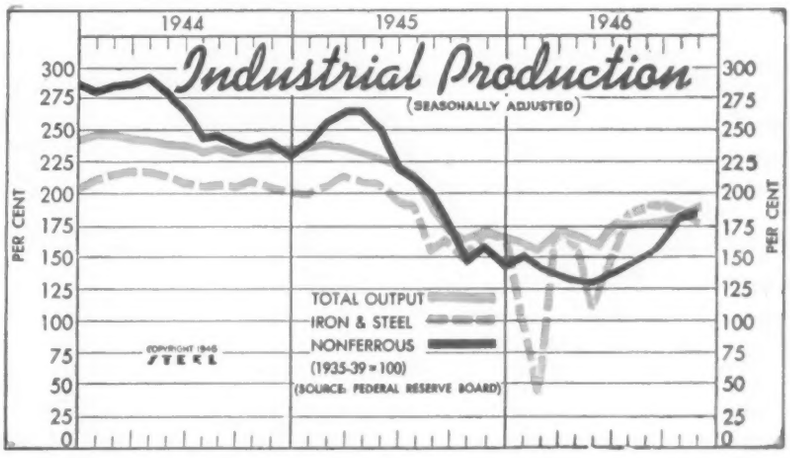
	—Employees † — (000 omitted)			—Total Payrolls— (Unit—$1,000,000)		
	1946	1945	1944 †	1946	1945	1944
Jan.*	522	564	583	$84.9	$150.3	$141.8
Feb.*	522	566	583	84.9	138.4	137.6
Mar.	570	570	578	138.8	155.0	145.3
April	582	567	573	134.3	147.0	138.9
May	563	565	569	121.4	154.0	145.4
June	578	562	570	125.6	144.1	140.5
July	585	557	571	138.0	141.0	141.8
Aug.	596	543	569	145.2	128.1	143.9
Sept.	596	521	565	139.6	119.1	142.2
Oct.	596	522	564	150.6	121.3	141.7
Nov.	...	533	564	....	122.8	143.1
Dec.	...	545	564	....	122.5	139.9

† Monthly average. * Figures for January and February, 1946, are merely averages derived from a report that combined those two strike-affected months.

Federal Reserve Board's Production Indexes

(1935-39=100)

	Total Production		Iron, Steel		Nonferrous	
	1946	1945	1946	1945	1946	1945
Jan.	160	234	102	197	151	253
Feb.	152	236	43	202	139	257
Mar.	168	235	169	210	141	267
Apr.	165	230	159	206	132	263
May	160	225	109	204	130	248
June	170	220	154	192	135	219
July	172	210	179	187	143	196
Aug	177	186	183	155	154	165
Sept.	180	167	184	163	167	139
Oct.	181	162	183	146	179	144
Nov.	182	168	176	167	187	148
Dec.	...	163	...	164	...	147
Avge.	...	203	...	183	...	204



Federal Reserve Board's Industrial Production Index

(1935-39 average = 100)

	1946	1945	1944	1943	1942	1941	1940	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929	1928	1927
Jan.	160	234	243	227	181	140	122	101	85	116	94	83	72	58	65	78	100	108	95	97
Feb.	152	236	244	232	183	144	116	101	84	118	92	85	75	57	63	79	100	108	95	97
Mar.	168	235	241	235	186	147	113	101	84	120	93	84	79	54	62	81	98	109	96	99
Apr.	165	230	239	237	189	144	112	98	82	120	98	82	80	58	58	80	98	110	96	96
May	160	225	236	239	191	154	116	98	81	121	100	83	80	68	56	80	96	112	97	97
June	170	220	235	236	193	159	122	103	81	119	103	84	79	78	54	78	93	114	98	97
July	172	210	230	240	197	160	122	105	86	120	104	84	73	86	53	76	89	114	99	95
Aug.	177	186	232	242	204	160	124	105	90	119	106	87	72	82	54	74	87	114	101	95
Sept.	180	167	230	244	208	161	127	114	93	115	108	89	70	77	58	70	85	113	102	94
Oct.	181	162	232	247	215	163	130	121	96	107	110	92	71	73	60	68	83	110	104	92
Nov.	182	168	232	247	220	166	134	124	100	96	113	94	72	69	60	67	81	105	106	92
Dec.	...	163	232	241	223	167	139	125	101	87	116	95	77	70	58	66	79	100	107	93
Av.	...	203	235	239	199	155	123	108	89	113	103	87	75	69	58	75	91	110	99	95

HOW TO STOP WASTING STAINLESS STEEL...

"The most significant pickling house development in decades is the descaling of alloy steels, especially stainless steels, without loss of the underlying metal—through use of the Du Pont sodium hydride process."

—says THE IRON AGE (Nov. 8, 1945)

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HANDLES LARGE VOLUME OF WORK in small space. Simple, compact, low-cost equipment. Bath tank of low-carbon steel, with a heater. Quench tank with exhaust fan. May be installed in a corner of the usual pickle house.

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Electrochemicals Dept., Wilmington 98, Del.

POSITIVE DESCALING with New Du Pont SODIUM HYDRIDE PROCESS

DU PONT CHEMICALS *and* **PROCESSES** *for Metal Treating*

DU PONT
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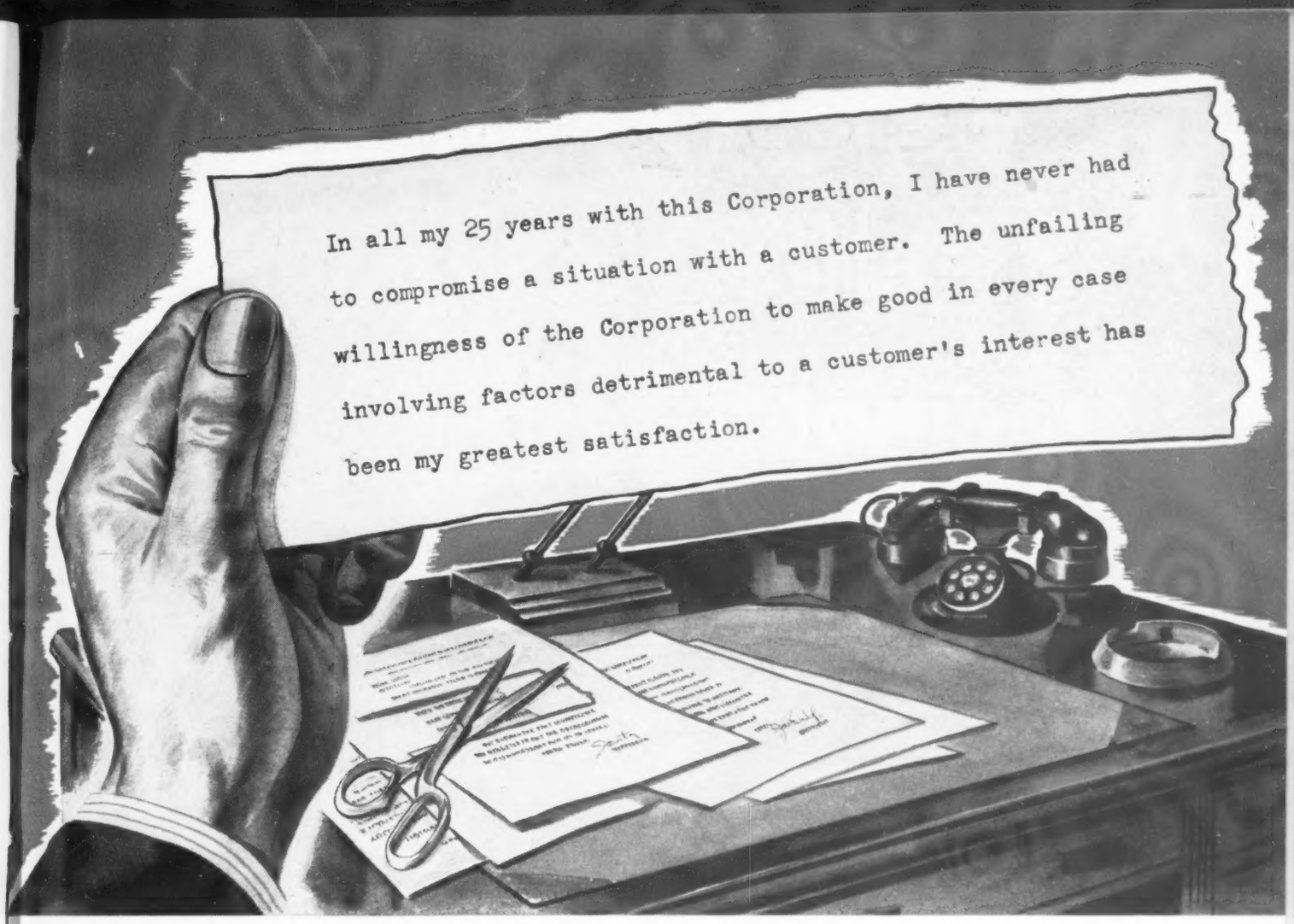
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY


In all my 25 years with this Corporation, I have never had to compromise a situation with a customer. The unfailing willingness of the Corporation to make good in every case involving factors detrimental to a customer's interest has been my greatest satisfaction.

"stolen" from a Falk Salesman's correspondence

The quotation above is indicative of an attitude; more important, it reflects a standard of organizational character and business ethics which has been developing for over fifty years.

This attitude is not confined to a few key people within this organization; it is found in every stratum of the organization. It is a composite illustration of how a molder in the foundry, a machine tool operator, or any other plant employee, a laboratory technician, an engineer, a salesman or an executive of this company thinks in relation to the products of this company, its responsibility to its own people, its customers, and the business world as a whole.

The men of Falk, wherever you find them — in the factory, in the office, in the field, or in retirement — reflect this attitude whenever you talk with them.

This is one of the important reasons why in research, in design, in engineering, in production, in the application of Falk's products to the customer's problem, you will find a deep-rooted sense of responsibility that has resulted in leadership in its industry.

The record of Falk products and service, and the opinion in which the company is held by both customer and prospect, have made the name Falk a good name in industry, and prove why it always pays to consult Falk.

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from *Shock...* *Vibration...Misalignment*

Only Falk Steelflex Couplings provide all three: Flexibility, Torsional Resilience* and Applicability to 90% of all industrial requirements.

These three factors are important to the coupling buyer. They offer him positive protection to connected machinery . . . the certain solution to applications where shock loads, misalignment and vibration are problems . . . and the opportunity of stocking one type of coupling to meet practically all of his coupling requirements, quickly and conveniently.

How Falk Steelflex Couplings are designed and produced to provide these factors is important. The diagrams on the opposite page explain how the Falk "grid-groove" design functions to protect machinery against ordinarily damaging conditions . . . how it compensates for parallel and angular misalignment and permits free end float.

A simplified method for selection, load classifications, service factors and dimensions is available to you in a booklet. You are enabled to meet your requirements dependably, quickly —with a reduced parts inventory.

In addition to the standard Type "F" which is applicable to more than 90% of all installations, Falk offers a line of large Steelflex couplings and couplings featuring the Steelflex principle but used for special service and dual-purpose applications.

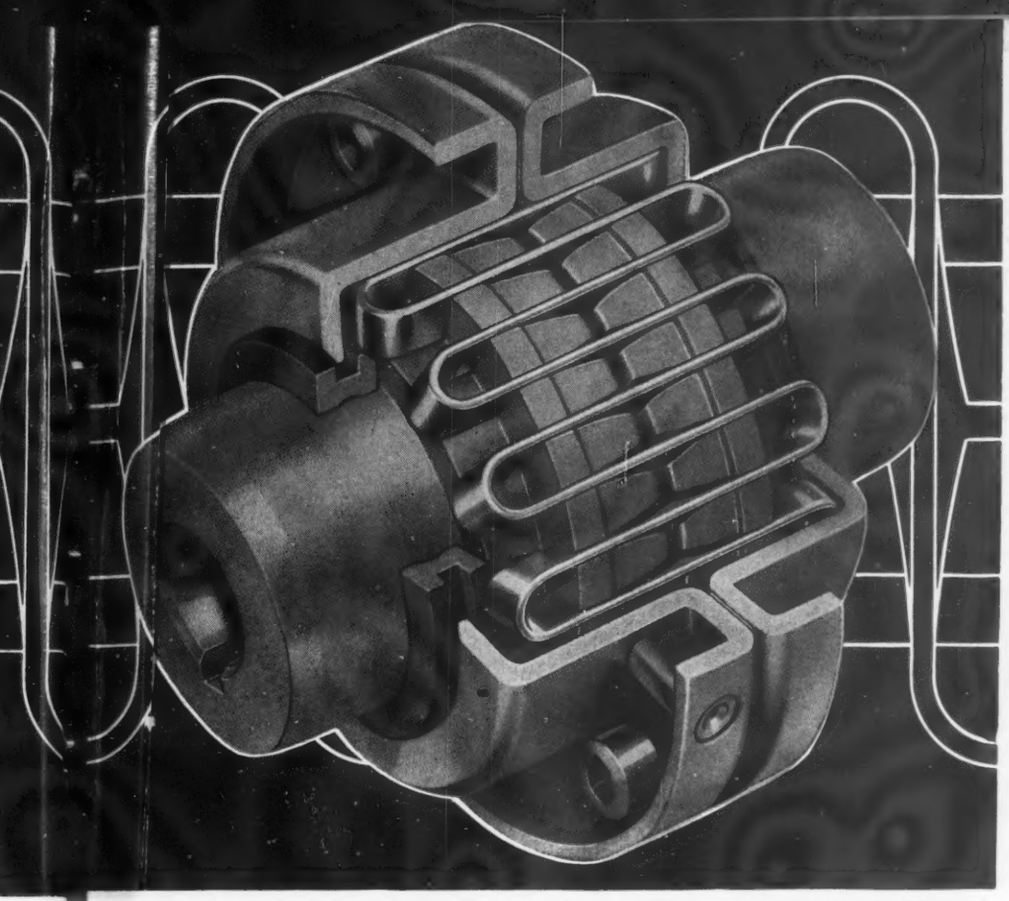
Get the complete information on Falk Steelflex Couplings either from your Falk representative or distributor, or write to Falk.

*** Torsional Resilience is the ability to spread the peak or shock loads over a relatively long increment of time, thereby greatly reducing stresses in the connected machinery.**

THE FALK CORPORATION

MILWAUKEE 8 WISCONSIN

For over fifty years precision manufacturers of Speed Reducers . . . Motoreducers . . . Flexible Couplings . . . Herringbone and Single Helical Gears . . . Heavy Gear Drives . . . Marine Turbine and Diesel Gear Drives and Clutches . . . Steel Castings . . . Contract Welding and Machine Work. District Offices, Representatives, or Distributors in principal cities.



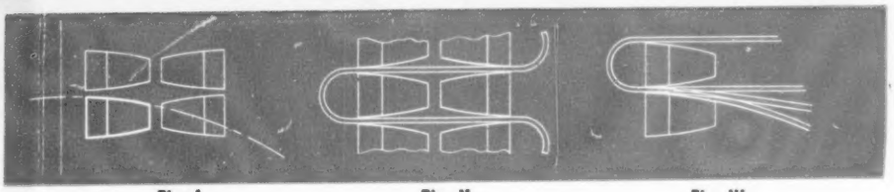


Fig. I Fig. II Fig. III

Fig. I. Grooves, in a precise arc, and with a radius and length proportional to the capacity of the coupling, are cut into two identical hubs of moderately high carbon steel—forged of Falk alloy cast steel . . . Fig. II. These grooves provide a slot for a grid member made of chrome alloy steel with an elastic limit of 180,000 pounds per square inch and an ultimate strength of 220,000 pounds per square inch . . . Fig. III. This grid fits snugly into the curved grooves cut into the hubs of the coupling. The grooves provide a scientifically cut bearing surface for the grid. This bearing surface extends from the outer to the inner edge of the grooves. The grid bears on the grooves in proportion to the load . . .

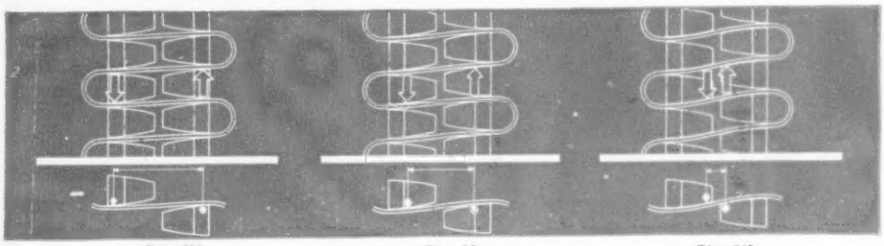
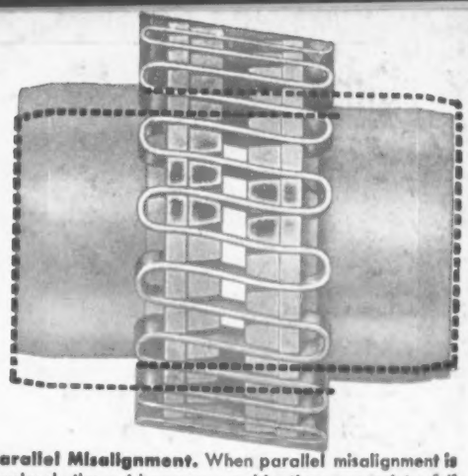
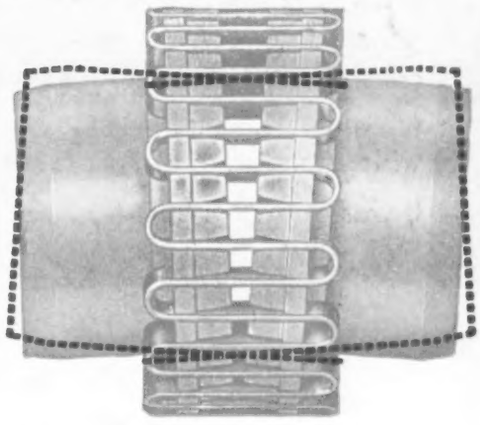


Fig. IV Fig. V Fig. VI

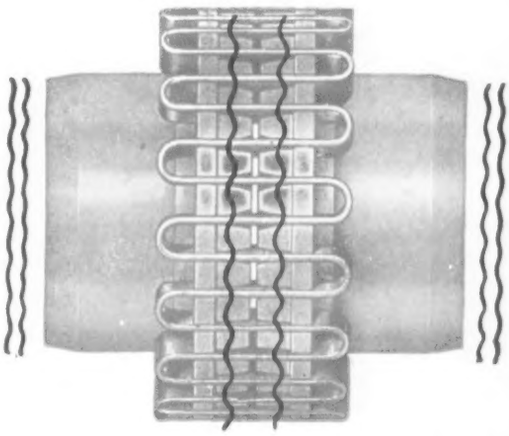
Fig. IV. Under light loads, the grid bears only at the outer edges of the grooves. This permits a long, free, elastic span between the outer edges of both hubs. Power is transmitted through almost the entire length of the grid rung . . . Fig. V. Under normal loads, the grid bears on a larger area of the grid grooves and the span of the grid run is shortened. It transmits more power and maintains its capacity to absorb shocks and dampen vibration . . . Fig. VI. Under peak loads, the grid rungs bear over almost all of the curved surfaces of the grooves. The span of the grid rung becomes very short. Under the impact of shock loads the grid flexes and continues to transmit power smoothly.



Parallel Misalignment. When parallel misalignment is involved, the grid-groove combination comes into full play. The movement of the grid in the lubricated grooves accommodates the misalignment, while still permitting full functioning of the grid-groove action of the coupling in absorbing shock and dampening vibration.



Angular Misalignment. Under angular misalignment the design of the Falk Steelflex Coupling permits a rocking and sliding action of lubricated grid and hubs that allows the greatest freedom of accommodation to angular misalignment, while at the same time transmitting the power through the resilient grid.



Free End Float. Because the grid member slides freely in the lubricated grooves, the Steelflex coupling permits unrestrained end float for the shafts of both the driving and driven members, or of either one. If it is desired that end float be restricted, provision can be made to limit it to any required amount.

FALK

. . . a good name in industry

FALK GEARS

...thoroughly effectual!

Regardless of the service for which they are purchased, Falk Gears meet the requirements of that service . . . This is no idle boast . . . It is a fact—based on the skill of Falk engineers; on an experience of over fifty years; on knowledge upon which present day standards were formulated; on the maintenance of a rigidly adhered to program of research and experimentation; on an unexcelled record of performance in every gear-using industry; on a world-wide acceptance of Falk Gears.

It was gears, as built by Falk, that first made the name Falk "a good name in industry." Falk maintains that reputation through the worth of other Falk products . . . Falk High Speed Precision Gears can be furnished in any size and for any service . . . The more complex your problems, the more it will pay you to consult Falk.

THE FALK CORPORATION
Milwaukee 8 Wisconsin

For over fifty years precision manufacturers of Speed Reducers . . . Motoreducers . . . Flexible Couplings . . . Herringbone and Single Helical Gears . . . Heavy Gear Drives . . . Marine Turbine and Diesel Gear Drives and Clutches . . . Steel Castings . . . Contract Welding and Machine Work. District Offices, Representatives, or Distributors in principal cities.

This Falk Herringbone Gear for Road Building Equipment, is being cut on a 9 foot vertical gear cutting machine.

FALK ...A GOOD NAME IN INDUSTRY

Tubular Goods and Wire Price Advances Usher in New Year

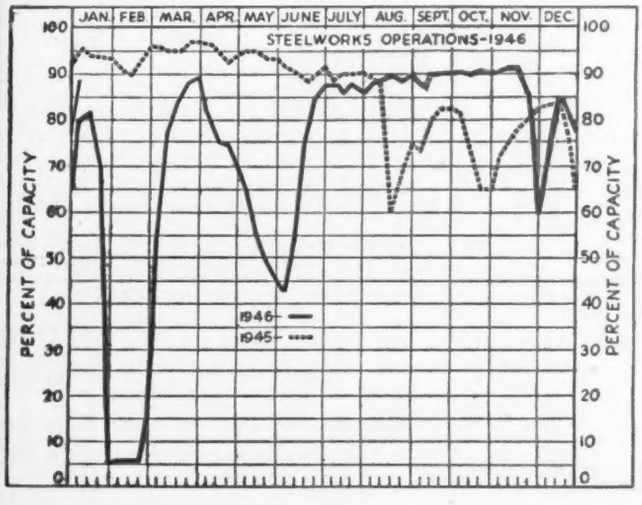
1947 prices on tin mill products also become effective, lifting finished steel average to $67.82 . . . Production recovers rapidly from holiday slowdown, the estimated national rate rising 11 points to 88 per cent

REVISIONS in finished steel base prices and schedules for extras continued on a rather broad front as the new year was ushered in. Producers are moving cautiously, however, in making adjustments. No blanket action covering all products has been taken by any major producer, and even the actions on individual items of a product classification have not been taken on an industry-wide basis.

During the past week, the most important adjustments announced by leading producers were on tubular goods and wire products. Base prices of bright, basic, bessemer and spring wire advanced $5 a ton while extras were revised to adjust inequalities. Base prices were advanced $6.50 a ton on oil country tubular goods, $7.30 on seamless standard and line pipe, and $9 on buttweld pipe. Other adjustments were made in boiler tubes, straight and fabricated mechanical tubing, and propeller shaft tubing.

One of the major effects of the revisions which marked the closing weeks of last year and the opening of the new year's business is expected to be in buying habits of large steel consumers. Some buyers are preparing to revise specifications of orders on mill books to eliminate extras wherever possible and are accepting standard methods of packaging, loading, marking, etc. Stricter control of inventory also is expected to develop as a result of the higher prices now being quoted on many steel products.

The higher price level has not resulted so far, however, in any substantial cancellation of orders or in a diminished desire to get early delivery of material. Most sellers of small bars, plates and light flat-rolled products will require the greater part of the first quarter to get caught up on shipments on which they were behind schedule at the turn of the new year. As a result, the mills are being forced to turn down heavy new tonnages desired for shipment during the first three months of 1947.



DISTRICT STEEL RATES

Percentage of Ingot Capacity Engaged in Leading Districts

	Week Ended Jan. 4	Change	Same Week 1946	Same Week 1945
Pittsburgh	96	+17.5	76	89
Chicago	88.5	+18.5	87	99.5
Eastern Pa.	78	+ 2	73	95
Youngstown	78	+ 8	83	90
Wheeling	86	+ 8.5	95	97.5
Cleveland	87	+ 9.5	84	75.5
Buffalo	90.5	None	81	60
Birmingham	99	+15	85	95
New England	89	+ 4	80	87
Cincinnati	82	+ 7	72	90
St. Louis	68	None	68	75
Detroit	88	None	81	88
Estimated national rate	88	+11	81	95.5

Based on weekly steelmaking capacity of 1,762,381 net tons for 1946; 1,831,636 tons for 1945; 1,791,287 tons for 1944.

The industry was handicapped last year in meeting the unprecedented peacetime demand by frequent interruptions in its operations by labor difficulties in its own and complementary industries as well as by shortages of raw materials, especially scrap. Production recovered rapidly from the Christmas shutdowns and was maintained at a high rate on New Year's Day. Executives said they were too short of output to lose the one day's production. "If our men were to take New Year's day off," one commented, "then some workers in the fabricating plants would have to take a week day off for lack of steel."

The estimated national steelmaking rate increased 11 points last week to 88 per cent of capacity. This compared with 85 per cent for the week preceding the Christmas holiday, 60.5 per cent for the recent low during the coal strike, and 91.5 per cent for mid-November. Production increased 18½ points to 88.5 per cent at Chicago, 17½ points to 96 per cent at Pittsburgh, 15 points to 99 per cent at Birmingham, 9½ points to 87 per cent at Cleveland, 8½ points to 86 per cent at Wheeling, 8 points to 78 per cent at Youngstown, 7 points to 82 per cent at Cincinnati, 4 points to 89 per cent in New England, and 2 points to 78 per cent in the eastern Pennsylvania district. Operations were unchanged at 90.5 per cent at Buffalo, 88 per cent at Detroit, and 68 per cent at St. Louis.

STEEL's composite market average on finished steel advanced to $67.82 from $64.91 for the previous week while that on steelmaking scrap was slightly higher at $31.17 compared with $31.08. The average on steelmaking pig iron and semifinished steel held unchanged at $29.56 and $41.60, respectively.

COMPOSITE MARKET AVERAGES

	Jan. 4	Dec. 28	Dec. 21	One Month Ago Dec., 1946	Three Months Ago Oct., 1946	One Year Ago Jan., 1946	Five Years Ago Jan., 1942
Finished Steel	$67.82	$64.91	$64.91	$64.75	$64.45	$58.27	$56.73
Semifinished Steel	41.60	41.60	41.60	41.10	40.60	37.80	36.00
Steelmaking Pig Iron	29.56	29.56	29.56	29.10	27.50	24.75	23.00
Steelmaking Scrap	31.17	31.08	30.75	27.68	19.17	19.17	19.17

Finished Steel Composite:—Average of industry-wide prices on sheets, strips, bars, plates, shapes, wire, nails, tin plate, standard and line pipe. Semifinished Steel Composite:—Average of industry-wide prices on billets, slabs, sheet bars, skelp and wire rods. Steelmaking Pig Iron Composite:—Average of basic pig iron prices at Bethlehem, Birmingham, Buffalo, Chicago, Cleveland, Neville Island, Granite City and Youngstown. Steelworks Scrap Composite:—Average of No. 1 heavy melting steel prices at Pittsburgh, Chicago and eastern Pennsylvania. Finished steel, net tons; others, gross tons.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished material (except tin plate) and wire rods, cents per lb; coke, dollars per net ton; others, dollars per gross ton.

Finished Material

	Jan. 4 1947	Dec., 1946	Oct., 1946	Jan., 1946
Steel bars, Pittsburgh	2.60c	2.55c	2.50c	2.25c
Steel bars, Philadelphia	2.96	2.91	2.86	2.57
Steel bars, Chicago	2.60	2.55	2.50	2.25
Shapes, Pittsburgh	2.35	2.35	2.35	2.10
Shapes, Philadelphia	2.48	2.48	2.48	2.215
Shapes, Chicago	2.35	2.35	2.35	2.10
Plates, Pittsburgh	2.50	2.50	2.50	2.25
Plates, Philadelphia	2.558	2.558	2.558	2.30
Plates, Chicago	2.50	2.50	2.50	2.25
Sheets, hot-rolled, Pittsburgh	2.50	2.48	2.425	2.20
Sheets, cold-rolled, Pittsburgh	3.20	3.19	3.275	3.05
Sheets, No. 24 galv., Pittsburgh	†3.55	†3.675	4.05	3.70
Sheets, hot-rolled, Gary	2.50	†2.481	2.425	2.20
Sheets, cold-rolled, Gary	3.20	3.218	3.275	3.05
Sheets, No. 24 galv., Gary	†3.55	†3.675	4.05	3.70
Hot-rolled strip, Pittsburgh	2.50	2.462	2.35	2.10
Cold-rolled strip, Pittsburgh	3.20	3.162	3.05	2.80
Bright basic, bess, wire, Pittsburgh	3.30	3.05	3.05	2.75
Wire nails, Pittsburgh	3.75	3.75	3.75	2.90
Tin plate, per base box, Pittsburgh	*$5.75	*$5.25	*$5.25	$5.00

* Nominal. † Base changed in December to 10 gage.

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$38.00	$38.00	$38.00	$36.00
Slabs, Pittsburgh, Chicago	39.00	39.00	39.00	36.00
Rerolling billets, Pittsburgh	39.00	39.00	39.00	36.00
Wire rods, No. 5 to $\frac{9}{32}$-inch, Pitts.	†2.55c	†2.425c	2.30c	2.15c

† Base changed in December.

Pig Iron

	Jan. 4, 1947	Dec., 1946	Oct., 1946	Jan., 1946
Bessemer, del. Pittsburgh	$31.77	$31.77	$29.77	$26.94
Basic, Valley	30.00	29.50	28.00	25.25
Basic, eastern del. Philadelphia	31.93	31.93	29.93	27.09
No. 2 fdry., del. Pgh. N. & S. sides	31.27	31.27	29.27	26.44
No. 2 fdry., del. Philadelphia	32.43	30.43	30.43	27.59
No. 2 foundry, Chicago	30.50	30.00	28.50	25.75
Southern No. 2, Birmingham	26.88	26.88	24.88	22.13
Southern No. 2, del. Cincinnati	30.94	30.94	28.94	26.05
Malleable, Valley	30.50	30.00	28.50	25.75
Malleable, Chicago	30.50	30.00	28.50	25.75
Charcoal, low phos., fob Lyles, Tenn.	37.50	37.50	33.00	33.00
Gray forge, del. McKees Rocks, Pa.	30.61	30.61	28.61	25.80
Ferromanganese, fob cars, Pittsburgh	140.00	140.00	140.00	140.00

Scrap

Heavy melting steel, No. 1, Pittsburgh	$32.50	$28.50	$20.00	$20.00
Heavy melt, steel, No. 2, E. Pa.	30.75	27.38	18.75	18.75
Heavy melting steel, Chicago	30.00	27.188	18.75	18.75
Rails for rolling, Chicago	34.75	31.00	22.25	22.25
No. 1 cast, Chicago	40.00	36.875	25.00	20.00

Coke

Connellsville, furnace ovens	$8.75	$8.75	$8.75	$7.50
Connellsville, foundry ovens	9.50	9.50	9.50	8.25
Chicago, by-product fdry., del.	15.35	15.288	15.10	13.75

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Finished steel quoted in cents per pound and semifinished in dollars per gross ton, except as otherwise noted. Delivered prices do not include the 3 per cent federal tax on freight or Jan. 1, 1947, increase in freight rates.

Semifinished Steel

Carbon Steel Ingots: Rerolling quality, standard analysis, $33, fob mill; forging quality, $38, Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown.

Alloy Steel Ingots: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, Coatesville, uncrop. $48.69.

Rerolling Billets, Blooms, Slabs: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Sparrows Point, Birmingham, Youngstown, $39; Detroit, del., $41.50; Duluth (billets), $41; Pac. ports (billets), $51.50 (Andrews Steel Co., carbon slabs, $41.)

Forging Quality Blooms, Slabs, Billets: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham, Youngstown, $47; Detroit, del., $49.50; Duluth, billets, $49; forging billets fob Pac. ports, $59.50.

(Andrews Steel Co., carbon forging billets, $50 gross ton at established basing points.)

Alloy Billets, Slabs, Blooms: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton, Massillon, $61; del. Detroit $63.50; eastern Mich. $64.50.

Sheet Bars: Pittsburgh, Chicago, Cleveland, Buffalo, Canton, Sparrows Point, Youngstown, $38. (Empire Sheet & Tin Plate Co., Mansfield, O., carbon, sheet bars, $39, fob mill.)

Skelp: Pittsburgh, Chicago, Sparrows Point, Youngstown, Coatesville, lb. 2.05c.

Wire Rods: Pittsburgh, Chicago, Cleveland, Birmingham, ¼ to $\frac{47}{64}$-in., inclusive, $2.55 per 100 lb. Galveston base, $2.65 and $2.80, respectively. Worcester, add $0.10; Pacific ports, $0.535. Pittsburgh Steel Co., $2.80; Portsmouth Steel Corp., $2.55; Keystone Steel & Wire Co., $2.70.

Bars

Hot-Rolled Carbon Bars and Bar-Size Shapes under 3-in.: Pittsburgh, Youngstown, Chicago, Gary, Cleveland, Buffalo, Birmingham base, 20 tons one size, 2.60c; Duluth, base, 2.60c; Detroit, del., 2.735c; eastern Mich., 2.785c; New York, del., 2.96c; Phila., del., 2.96c; Gulf ports, dock, 2.995c; Pac. ports, dock, 3.285c-3.56c.

Rail Steel Bars: Same prices as for hot-rolled carbon bars except base is 5 tons.

Hot-Rolled Alloy Bars: Pittsburgh, Youngstown, Chicago, Canton, Massillon, Buffalo, Bethlehem, base 20 tons one size, 3.05c; Detroit, del., 3.185c. (Texas Steel Co. uses Chicago base price as maximum fob Fort Worth, Tex., price on sales outside Texas, Oklahoma.)

AISI Series	(*Basic O-H)	AISI Series	(*Basic O-H)
1300	$0.108	4300	$1.839
2300	1.839	4600	1.298
2500	2.759	4800	2.326
3000	0.541	5100	0.379
3100	0.920	5130 or 5152	0.494
3200	1.461	6120 or 6152	1.028
3400	3.462	6145 or 6150	1.298
4000	0.487	8612	0.703
4100 (.15-.25 Mo)	0.757	8720	0.757
(.20-.30 Mo)	0.812	9830	1.407

* Add 0.25 for acid open-hearth; 0.50 electric.

Cold-Finished Carbon Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base, 20,000-39,999 lb, 3.20c; Detroit, 3.25c; Toledo, 3.35c.

Cold-Finished Alloy Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, base, 3.624c; Detroit, del., 3.759c; eastern Mich., 3.809c.

Reinforcing Bars (New Billet): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Sparrows Point, Buffalo, Youngstown, base, 2.45c; Detroit, del., 2.585c; eastern Mich. and Toledo, 2.635c; Gulf ports, dock, 2.835c; Pacific ports, dock 2.885c.

Reinforcing Bars (Rail Steel): Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Buffalo, base, 2.45c; Detroit, del., 2.585c; eastern Mich. and Toledo, del., 2.635c; Gulf ports, dock, 2.835c.

Iron Bars: Single refined, Pitts., 6.15c; double refined, 7.00c; Pittsburgh, staybolt, 7.85c.

Sheets, Strip

Hot-Rolled Sheets: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Buffalo, Youngstown, Sparrows Point, Middletown, base, 2.50c; Detroit, del., 2.635c; eastern Mich., del., 2.685c; Philadelphia, del., 2.69c; New York, del., 2.72c; Pacific ports, 3.085c.

(Andrews Steel Co. quotes on Middletown, O., base for shipment to Detroit area; Alan Wood Steel Co., Conshohocken, Pa., quotes 3.25c, Sparrows Point, Md., base; Granite City Steel Co., 2.875c, fob Granite City, Ill., 2.775c, fob Gary or Birmingham.)

Cold-Rolled Sheets: Pittsburgh, Chicago, Cleveland, Gary, Buffalo, Youngstown, Middletown, base, 3.20c; Granite City, base, 3.30c; Detroit, del., 3.335c; eastern Mich., del., 3.385c; New York, del., 3.54c; Philadelphia, del., 3.56c; Pacific ports, 3.885c.

Galvanized Sheets, No. 10: Pittsburgh, Chicago, Gary, Birmingham, Youngstown, Sparrows Point, Middletown, base, 3.55c; New York, del., 3.77c; Philadelphia, del., 3.74c; Pacific ports, 4.135c.

Corrugated Galvanized Sheets, No. 10: Pittsburgh, Chicago, Gary, Birmingham, base, 3.55c.

Culvert Sheets, No. 16, not corrugated, copper alloy: Pittsburgh, Chicago, Gary, Birmingham, 4.15c; Granite City, 4.25c; Pacific ports, 4.635c; copper iron 4.50c; pure iron, 4.50c.

Aluminized Sheets, No. 20 hot-dipped, coils or cut to lengths: Pittsburgh, 9.00c.

Long Ternes, No. 10: Pittsburgh, Chicago, Gary, base, 3.55c; Pacific ports, 4.335c.

Enameling Sheets, No. 12: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, base, 3.55c; Granite City, base, 3.65c; Detroit, del., 3.685c; eastern Mich., 3.735c; Pacific ports, 4.235c.

Electrical Sheets, No. 24: (Prices nominal pending revision)

	Pittsburgh Base	Pacific Ports	Granite City
Field grade	3.90c	4.685c	4.00c
Armature	4.25c	5.035c	4.35c
Electrical	4.75c	5.535c	4.85c
Motor	5.425c	6.21c	5.525c
Dynamo	6.125c	6.91c	6.225c
Transformer			
72	6.625c	7.41c	....
65	7.625c	8.41c	....
58	8.125c	8.91c	....
52	8.925c	9.71c	....

Hot-Rolled Strip: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Middletown, base, 2.50c; Detroit, del., 2.635c; eastern Mich., del., 2.685c; Pacific ports, 3.185c. (Superior Steel Corp., 3.30c, Pittsburgh.)

Cold-Rolled Strip, 0.25 carbon and less: Pittsburgh, Cleveland, Youngstown, 3.20c; Chicago, base, 3.30c; Detroit, del., 3.335c; eastern Mich., 3.385c; Wooster, base, 3.40c. (Superior Steel Corp., 4.70c, Pittsburgh.)

Cold-Finished Spring Steel, 0.26-0.50 carbon: Pittsburgh, Cleveland, base, 3.03c; add 0.20c for Worcester.

Tin, Terne Plate

Tin Plate: Pittsburgh, Chicago, Gary, 100-lb base box, $5.75; Granite City, Birmingham, Sparrows Point, $5.85.

Electrolytic Tin Plate: Pittsburgh, Gary, 100-lb base box 0.25 lb tin, $4.85; 0.50 lb tin, $5.05; 0.75 lb tin, $5.25; Granite City, Birmingham, Sparrows Point, $4.95, $5.15, $5.35, respectively.

Tin Mill Black Plate: Pittsburgh, Chicago, Gary, base 29-gage and lighter, 3.60c; Granite City, Birmingham, Sparrows Point, 3.50c; Pacific ports, boxed 4.435c.

Manufacturing Ternes (Special Coated): Pittsburgh, Chicago, Gary, 100-base box, $4.90; Granite City, Birmingham, Sparrows Point, $5.00.

Roofing Ternes: Pittsburgh base per package 112 sheets; 20 x 28 in., coating I. C. 8-lb $13.50; 15-lb $15.50.

Plates

Carbon Steel Plates: Pittsburgh, Chicago, Gary, Cleveland, Birmingham, Youngstown, Sparrows Point, Coatesville, Claymont, 2.50c; Geneva, Utah, 2.65c; New York, del., 2.71c; Phila., del., 2.558c; St. Louis, del., 2.74c; Boston, del., 2.86c; Pacific ports, 3.085-3.46c; Gulf ports, 2.885c.
(Granite City Steel Co., carbon plates, 2.65c fob Chicago or Birmingham; Central Iron & Steel Co., Harrisburg, Pa., 3.05c, basing points; Lukens Steel Co., Coatesville, Pa., and Worth Steel Co., Claymont, Del., 2.80c, base; Alan Wood Steel Co., Conshohocken, Pa., 2.75c, base.)

Floor Plates: Pittsburgh, Chicago, 3.75c; Pacific ports, 4.435c; Gulf ports, 4.135c.

Open-Hearth Alloy Plates: Pittsburgh, Chicago, Coatesville, 3.787c; Gulf ports, 4.308c; Pacific ports, 4.525c.

Clad Steel Plates: Coatesville, 10% cladding: nickel clad, 18.72c; inconel-clad, 26.00c; monel-clad, 24.96c.

Shapes

Structural Shapes: Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Bethlehem, 2.35c; Geneva, Utah, 2.50c; New York, del., 2.54c; Phila., del., 2.48c; Pacific ports, 3.035-3.41c; Gulf ports, 2.735c.
(Phoenix Iron Co., Phoenixville, Pa., 3.05c, Bethlehem, Pa.)

Steel Piling: Pittsburgh, Chicago, Buffalo, $3 per 100 lb; Pacific ports, $3.585.

Wire and Wire Products

(Fob Pittsburgh, Chicago, Cleveland and Birmingham per 100 pounds).

Wire to Manufacturers in carloads

Bright, basic or bessemer	*$3.30
Spring (except Birmingham)	*$4.25

Wire Products to Trade

Nails and Staples

Standard and cement-coated	†$3.75
Galvanized	‡$3.75

Wire, Merchant Quality

Annealed	§$3.95
Galvanized	§$4.40

(Fob Pittsburgh, Chicago, Cleveland, Birmingham, per base column)

Woven fence, 15½ gage and heavier	84
Barbed wire, 80-rod spool	††94
Barbless wire, twisted	94
Fence posts	84
Bale ties, single loop	86

* Add $0.10 for Worcester, $0.05 for Duluth and $0.535 for Pacific ports. Portsmouth Steel Corp., $3.425, Pittsburgh Steel Co., $3.55 for bright basic.

† Add $0.30 for Worcester, $0.535 for Pacific ports. Nichols Wire & Steel, $4.25; Pittsburgh Steel Co., $4.10.

‡ Add $0.535 for Pacific ports.

§ Add $0.10 for Worcester; $0.735 Pacific ports.

Tubular Goods

(Base prices and extras advanced; following prices for welded pipe and boiler tubes are nominal pending issuance of new schedules.)

Welded Pipe: Base price in carloads, threaded and coupled to consumers about $200 per net ton. Base discounts on steel pipe Pittsburgh and Lorain, O.; Gary, Ind., 2 points less on lap weld, 1 point less on butt weld. Pittsburgh base only on wrought iron pipe.

Butt Welded

	Steel			Iron	
In.	Blk.	Galv.	In.	Blk.	Galv.
¼ & ⅜	56	37½	⅛	21	0½
½	60½	48½	¼	27	7
⅝	53	30	⅜	31	13
¾	63½	52	½	35	15½
1-3	65½	54½	¾	34½	15

Lap Weld

	Steel			Iron	
In.	Blk.	Galv.	In.	Blk.	Galv.
			1¼	20	0½
2	58	46½	1½	25½	7
2½-3	61	49½	2	27½	9
3½-6	63	51½	2½-3½	28½	11½
7-8	62	49½	4	30½	15
9-10	61½	49	4½-8	29½	14
11-12	60½	48	9-12	25½	9

Boiler Tubes: Net base prices per 100 feet fob Pittsburgh in carload lots, minimum wall, cut length 4 to 24 feet, inclusive.

		—Seamless—		—Elec. Weld—	
O.D.		Hot	Cold	Hot	Cold
sizes	B.W.G.	Rolled	Drawn	Rolled	Rolled
1"	13	....	$9.90	$9.36	$9.65
1¼"	13	....	11.73	9.63	11.43
1½"	13	$10.91	12.96	10.63	12.64
1¾"	13	12.41	14.75	12.10	14.37
2"	13	13.90	16.52	13.53	16.19
2¼"	13	15.50	18.42	15.06	18.03
2¼"	12	17.07	20.28	16.57	19.83
2½"	12	18.70	22.21	18.11	21.68
2¾"	12	19.82	23.54	19.17	22.95
3"	12	20.79	24.71	20.05	24.02
3½"	11	26.24	31.18	25.30	30.29
4"	10	32.56	38.68	31.32	37.52
4½"	9	43.16	51.29	....	....
5"	9	49.96	59.36	....	....
6"	7	76.71	91.14	....	....

Pipe, Cast Iron: Class B, 6-in. and over, $65 per net ton, Birmingham; $70, Burlington, N. J.; $67.80, del., Chicago; 4-in. pipe, $5 higher, Class A pipe, $3 a ton over class B.

Rails, Supplies

Rails: Standard, over 60-lb, fob mill, $2.50 per 100 lb. Light rails (billet), Chicago, Birmingham, $2.85 per 100 lb; Pittsburgh, del., $2.875; West Virginia Steel & Mfg. Co., $55 per net ton Relaying, 35 lb and over, fob railroad and basing points, $31-$33 per net ton.

Supplies: Track bolts, 6.50c; heat treated, 6.75c. Tie plates, $2.80 per 100 lb, fob mill. Splice bars, $3 per 100 lb. Standard spikes, 3.65c-4.50c; screw spikes, 5.30c-6.40c.

Bolts, Nuts

Fob Pittsburgh, Cleveland, Birmingham, Chicago, Lebanon, Pa. Additional discounts: 5 for carloads; 15 for full containers, except tire, step and plow bolts.

(Base prices advanced 12 per cent, effective July 27, 1946; following discounts nominal, effective Dec. 2, pending stabilization of market at higher price level.

Carriage and Machine

½ x 6 and smaller	65½ off
Do., ⅞ and ⅝ x 6-in. and shorter	63½ off
Do., ¾ to 1 x 6-in. and shorter	61 off
1⅛ and larger, all lengths	59 off
All diameters, over 6-in. long	59 off
Tire bolts	50 off
Step bolts	56 off
Plow bolts	65 off

Stove Bolts

In packages, nuts separate, 71-10 off; bulk, 80 off on 15,000 of 3-in. and shorter, or 5000 over 3 in., nuts separate.

Nuts

Semifinished hex	U.S.S.	S.A.E.
⅞-in. and smaller	..	64
½-in. and smaller	62	..
½-in.-1-in.	..	60
⅝-in.-1-in.	59	..
1⅛-in.-1½-in.	57	58
1⅝-in. and larger	56	..

Additional discount of 15 for full kegs.

Hexagon Cap Screws

Upset 1-in., smaller	64 off
Milled 1-in., smaller	60 off

Square Head Set Screws

Upset 1-in. and smaller	71 off
Headless, ¼-in. and larger	60 off
No. 10 and smaller	70 off

Rivets

Fob Pittsburgh, Cleveland, Chicago Birmingham, Lebanon, Pa.

Structural	5.25c
⅞-inch and under	55-5 off

Washers, Wrought

Fob Pittsburgh, Chicago, Philadelphia, to jobbers and large nut and bolt manufacturers, lcl ..... $2.75-$3.00 off

Tool Steels

Tool Steel: Pittsburgh, Bethlehem, Syracuse, Canton, O., Dunkirk, N. Y., base, cents per lb; reg. carbon 15.15c; extra carbon 19.48c; special carbon 23.80c; oil-hardening 25.97c; high carbon-chromium 46.53c.

W	Cr	V	Mo	Base, per lb
18.00	4	1	...	72.49c
1.5	4	1	8.5	58.43c
....	4	2	3	58.43c
6.40	4.15	1.90	5	62.22c
5.50	4.50	4	4.50	75.74c

Stainless Steels

Base, Cents per lb

	Bars	Plates	Sheets	H.R. Strip	C.R. Strip
CHROMIUM NICKEL STEELS					
302	25.96c	29.21c	36.79c	23.93c	30.30c
303	28.13	31.38	38.95	29.21	35.71
304	27.05	31.38	38.95	25.45	32.46
308	31.38	36.79	44.36	30.84	37.87
309	38.95	43.28	50.85	40.03	50.85
310	53.02	56.26	57.35	52.74	60.50
312	38.95	43.28	53.02	....	....
*316	43.28	47.61	51.94	43.28	51.94
§321	31.38	36.79	44.36	31.65	41.12
†347	35.71	41.12	48.69	35.71	45.44
431	20.56	23.80	31.38	18.94	24.35
STRAIGHT CHROMIUM STEEL					
403	23.93	26.51	31.92	22.99	29.21
**410	20.02	23.93	28.67	18.39	23.80
416	20.56	23.80	29.21	19.75	25.45
††420	25.96	30.84	36.25	25.70	39.49
430	20.56	23.80	31.38	18.94	24.35
‡‡430F	21.10	24.35	31.92	20.29	26.51
440A	25.96	30.84	36.25	25.70	39.49
442	24.35	27.59	35.17	25.96	34.62
443	24.35	27.59	35.17	25.96	34.62
446	29.76	33.00	39.19	37.87	56.26
501	8.66	12.98	17.04	12.98	18.39
502	9.74	14.07	18.12	14.07	19.48
STAINLESS CLAD STEEL (20%)					
304	....	19.48	20.56	....	....
410	....	17.31	18.39	....	....
430	....	17.85	18.94	....	....
446	....	19.48	20.56	....	....

(Fob Pittsburgh and Washington, Pa., plate prices include annealing and pickling.)

* With 2-3% molybdenum. § With titanium. † With columbium. ** Plus machining agent. †† High carbon. ‡‡ Free machining.

Metallurgical Coke

Price Per Net Ton

Beehive Ovens

Connellsville, furnace	*$8.75
Connellsville, foundry	9.25- 9.75
New River, foundry	10.25-10.50
Wise county, foundry	9.00- 9.50
Wise county, furnace	8.50- 9.00

By-Product Foundry

Kearney, N. J., ovens	14.40
Chicago, outside delivered	14.35
Chicago, delivered	15.35
Terre Haute, delivered	14.85
Milwaukee, ovens	15.10
New England, delivered	16.00
St. Louis, delivered	†15.10
Birmingham, delivered	12.25
Indianapolis, delivered	14.85
Cincinnati, delivered	14.60
Cleveland, delivered	14.50
Buffalo, delivered	14.75
Detroit, delivered	15.10
Philadelphia, delivered	15.28

* Operators of hand-drawn ovens using trucked coal, $9.35.

† 15.68 from other than Ala., Mo., Tenn.

Coke By-Products

Spot, gal, freight allowed east of Omaha.

Pure and 90% benzol	15.00c
Toluol, two degree	22.00c
Industrial xylol	22.00c
Solvent naphtha	26.00c

Per pound fob works

Phenol (car lots, returnable drums)	11.25c
Do., less than carlots	12.00c
Do., tank cars	10.25c

Eastern plants, per pound

Naphthalene flakes, balls, bbl, to jobbers, "household use"	9.00c

Per ton, bulk, fob plants

Sulphate of ammonia	$30.00

WAREHOUSE STEEL PRICES

Base delivered prices, cents per pound, for delivery within switching limits, subject to established extras. Quotations based on mill prices announced **March 1, 1946**

	Hot-rolled bars†	Structural shapes	Plates	Floor plates	Hot-rolled sheets† (10-gage base)	Hot-rolled strip† (14-gage and lighter, 6-in. and narrower)	Hot-rolled strip† (12-gage and heavier, wider than 6-inch)	Galvanized flat sheets (24-gage base)†	Cold-rolled sheets† (17-gage base)	Cold finished bars†	Cold-rolled strip†
Boston	4.356[1]	4.203[1]	4.203[1]	6.039[1]	4.050[1]	5.548[1]	4.418[1]	5.725[13]	5.031[14]	4.656[21]	4.965
New York	4.134[1]	4.038[1]	4.049[1]	5.875[1]	3.856[1]	4.375[1]	4.275[1]	5.501[12]	4.838[14]	4.584[21]	5.075
Jersey City	4.155[1]	4.018[1]	4.049[1]	5.875[1]	3.856[1]	4.375[1]	4.275[1]	5.501[12]	4.890[14]	4.605[21]	5.075
Philadelphia	4.114[1]	3.937[1]	3.875[1]	5.564[1]	3.774[1]	4.664[1]	4.554[1]	5.499[15]	5.139[25]	4.564[21]	5.061
Baltimore	4.093[1]	4.05[1]	3.865[1]	5.543[1]	3.64[1]	4.293[1]	4.193[1]	5.365[17]	5.118[20]	4.543[21]	....
Washington	4.232[1]	4.22[1]	4.067[1]	5.632[1]	3.842[1]	4.432[1]	4.332[1]	5.667[17]	5.007[24]	4.532[21]	....
Norfolk, Va.	4.377[1]	4.303[1]	4.262[1]	5.777[1]	4.037[1]	4.927[1]	4.477[1]	5.862[17]	4.552[24]	4.677[21]	....
Bethlehem, Pa.*	....	3.70[1]	....	....	....	....	....	....	....	....	....
Claymont, Del.*	....	....	3.70[1]	....	....	....	....	....	....	....	....
Coatesville, Pa.*	....	....	3.70[1]	....	....	....	....	....	....	....	....
Buffalo (city)	3.60[1]	3.65[1]	3.92[1]	5.55[1]	3.575[1]	4.21[1]	4.11[1]	5.20[15]	4.625[16]	4.20[21]	4.96
Buffalo (country)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.475[1]	3.85[1]	3.750[1]	5.10[15]	4.525[16]	4.10[21]	4.60
Pittsburgh (city)	3.60[1]	3.65[1]	3.65[1]	5.25[1]	3.575[1]	3.95[1]	3.850[1]	5.327[12]	4.625[24]	4.20[21]	4.70
Pittsburgh (country)	3.50[1]	3.55[1]	3.55[1]	5.15[1]	3.475[1]	3.85[1]	3.750[1]	5.10[12]	4.525[24]	4.10[21]	4.60
Cleveland (city)	3.60[1]	3.88[1]	3.65[1]	5.48[1]	3.575[1]	3.95[1]	3.850[1]	5.347[13]	4.625[24]	4.20[21]	4.70
Cleveland (country)	3.50[1]	....	3.55[1]	....	3.475[1]	3.85[1]	3.750[1]	....	4.525[24]	4.10[21]	4.00
Detroit	3.735[1]	3.987[1]	3.935[1]	5.607[1]	3.710[1]	4.085[1]	3.985[1]	5.526[15]	4.760[24]	4.25[12]	4.98
Omaha (city, del.)	4.32[1]	4.37[1]	4.37[1]	5.97[1]	4.045[1]	4.52[1]	4.42[1]	6.00[15]	5.72[24]	4.945[21]	....
Omaha (country)	4.22[1]	4.27[1]	4.27[1]	5.87[1]	3.945[1]	4.42[1]	4.32[1]	5.90[15]	....	....	....
Cincinnati	3.902[1]	3.983[1]	3.952[1]	5.583[1]	3.671[1]	4.046[1]	3.946[1]	5.296[15]	4.271[24]	4.602[21]	....
Youngstown*	....	....	....	....	....	....	....	4.85[12]	....	....	....
Middletown, O.*	....	....	....	....	3.475[1]	3.85[1]	3.750[1]	5.10[16]	....	....	....
Chicago (city)	3.75[1]	3.80[1]	3.80[1]	5.40[1]	3.475[1]	3.95[1]	3.850[1]	5.40[15]	4.425[24]	4.20[21]	4.90
Milwaukee	3.908[1]	3.958[1]	3.958[1]	5.558[1]	3.633[1]	4.108[1]	4.008[1]	5.558[15]	4.583[24]	4.358[21]	5.058
Indianapolis	3.83[1]	3.88[1]	3.88[1]	5.48[1]	3.743[1]	4.118[1]	4.018[1]	5.368[15]	4.793[24]	4.43[21]	5.060
St. Paul	4.092[3]	4.142[3]	4.142[3]	5.742[3]	3.817[3]	4.292[7]	4.192[3]	5.666[15]	4.767[24]	4.852[21]	5.398
St. Louis	3.918[1]	3.968[1]	3.968[1]	5.568[1]	3.643[1]	4.118[1]	4.018[1]	5.622[15]	4.593[24]	4.522[21]	5.222
Memphis, Tenn.	4.296[1]	4.346[1]	4.346[1]	6.071[1]	4.221[1]	4.596[1]	4.496[5]	5.746[15]	....	4.821[21]	....
Birmingham	3.75[1]	3.80[1]	3.80[1]	6.153[1]	3.675[1]	4.05[1]	4.05[1]	5.20[15]	5.077[24]	4.99[21]	5.465
New Orleans (city)	4.358[1]	4.408[1]	4.408[1]	6.329[1]	4.283[1]	4.658[1]	....	5.808[15]	5.304[24]	5.079[21]	....
Houston, Tex.	4.00[3]	4.50[1]	4.50[1]	5.75[3]	3.988[3]	4.668[3]	4.563[6]	5.763[24]	5.819[10]	4.10[21]	....
Los Angeles	4.65[4]	4.70[4]	5.80[4]	7.05[4]	4.95[4]	5.30[4]	5.200[4]	6.55[12]	6.60[6]	6.105[21]	5.868
San Francisco	4.285[7]	4.185[7]	4.185[7]	5.885[7]	4.16[7]	5.885[1]	4.535[1]	6.385[15]	6.91[15]	5.783[21]	7.588
Portland, Oreg.	4.70[27]	4.70[27]	5.00[27]	6.75[27]	4.875[27]	6.65[27]	5.000[27]	6.20[15]	6.825[15]	5.983[15]	....
Tacoma, Wash.	4.60[6]	4.70[6]	5.00[6]	6.75[6]	4.87[6]	5.80[6]	4.60[6]	6.40[15]	6.55[15]	6.23[21]	....
Seattle	4.60[6]	4.70[6]	5.00[6]	6.75[6]	4.87[6]	5.80[6]	4.60[6]	6.40[15]	6.55[15]	6.23[21]	....

* Basing point cities with quotations representing mill prices, plus warehouse spread.

† Prices nominal pending establishment of new quotations to reflect mill increases and higher freight rates.

BASE QUANTITIES

—[1]400 to 1999 pounds; [2]—400 to 14,999 pounds; [3]—any quantity; [4]—300 to 1999 pounds; [5]—400 to 8999 pounds; [6]—300 to 9999 pounds; [7]—400 to 39,999 pounds; [8]—under 2000 pounds; [9]—under 4000 pounds; [10]—500 to 1499 pounds; [11]—one bundle to 39,999 pounds; [12]—150 to 2249 pounds; [13]—150 to 1499 pounds; [14]—three to 24 bundles; [15]—450 to 1499 pounds; [16]—one bundle to 1499 pounds; [17]—one to nine bundles; [18]—one to six bundles; [19]—100 to 749 pounds; [20]—300 to 1999 pounds; [21]—1500 to 39,999 pounds; [22]—1500 to 1999 pounds; [23]—1000 to 39,999 pounds; [24]—400 to 1499 pounds; [25]—1000 to 1999 pounds; [26]—under 25 bundles. Cold-rolled strip, 2000 to 39,999 pounds, base; [27]—300 to 4999 pounds.

ORES

Lake Superior Iron Ore

Gross ton, 51½% (Natural)
Lower Lake Ports

Old range bessemer	$5.45
Old range nonbessemer	5.30
Mesabi bessemer	5.20
Mesabi nonbessemer	5.05
High phosphorus	5.05

Eastern Local Ore

Cents, units, del. E. Pa.

Foundry and basic 56-63% contract	13.00

Foreign Ore

Cents per unit, cif Atlantic ports

Manganiferous ore, 45-55% Fe., 6-10% Mn.	Nom.
N. African low phos.	Nom.
Swedish basic, 60 to 68%	13.00
Spanish, No. African basic, 50 to 60%	Nom.
Brazil iron ore, 68-69% fob Rio de Janeiro	7.50–8.00

Tungsten Ore

Chinese Wolframite, per short ton unit, duty paid	$24.00

Chrome Ore

Gross ton fob cars, New York, Philadelphia, Baltimore, Charleston, S. C., Portland, Oreg., or Tacoma, Wash.
(S S paying for discharge; dry basis, subject to penalties if guarantees are not met.)

Indian and African

48% 2.8:1	$39.75
48% 3:1	41.00
48% no ratio	31.00

South African (Transvaal)

44% no ratio	$27.40
45% no ratio	28.30
48% no ratio	31.00
50% no ratio	32.80

Brazilian—nominal

44% 2.5:1 lump	$33.65
48% 3:1 lump	43.50

Rhodesian

45% no ratio	$28.30
48% no ratio	31.00
48% 3:1 lump	41.00

Domestic (seller's nearest rail)

48% 3:1	$43.50

less $7 freight allowance.

Manganese Ore

Sales prices of Office of Metals Reserve, cents per gross ton unit, dry, 48%, at New York, Philadelphia, Baltimore, Norfolk, Mobile and New Orleans, 85c; Fontana, Calif., Provo, Utah, and Pueblo, Colo., 91c; prices include duty on imported ore and are subject to established premiums, penalties and other provisions. Price at basing points which are also points of discharge of imported manganese ore is fob cars, shipside, at dock most favorable to the buyer. Outside shipments direct to consumers at 15c to 17c per unit less than Metal Reserve prices.

Molybdenum

Sulphide conc., lb., Mo. cont., mines	$0.75

NATIONAL EMERGENCY STEELS (Hot Rolled)

Basic open-hearth Electric furnaces

(Extras for alloy content)

Designation	Chemical Composition Limits, Per Cent — Carbon	Mn	Si	Cr	Ni	Mo	Bars per 100 lb	Billets per GT	Bars per 100 lb	Billets per GT
NE 9415	.13-.18	.80-1.10	.20-.35	.30-.50	.30-.60	.08-.15	$0.812	$16.230	$1.353	$27.050
NE 9425	.23-.28	.80-1.20	.20-.35	.30-.50	.30-.60	.08-.15	.812	16.230	1.353	27.050
NE 9442	.40-.45	1.00-1.30	.20-.35	.30-.50	.30-.60	.08-.15	.866	17.312	1.407	28.132
NE 9722	.20-.25	.50-.80	.20-.35	.10-.25	.40-.70	.15-.25	.703	14.066	1.244	24.886
NE 9912	.10-.15	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.298	25.968	1.677	33.542
NE 9920	.18-.23	.50-.70	.20-.35	.40-.60	1.00-1.30	.20-.30	1.298	25.968	1.677	33.542

Extras are in addition to a base price of 2.921c per pound on finished products and $58.43 per gross ton on semifinished steel major basing points and are in cents per pound and dollars per gross ton. No prices quoted on vanadium alloy.

PIG IRON

Maximum prices per gross ton. Delivered prices do not include 3 per cent federal tax or Jan. 1, 1947, increase in freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable
Bethlehem, Pa., base	$31.50	$31.00	$32.50	$32.00
Newark, N. J., del.	33.20	32.70	34.20	33.70
Brooklyn, N. Y., del.	34.28	....	....	34.78
Birdsboro, Pa., base	31.50	31.00	32.50	32.00
Birmingham, base	26.88	25.50	31.50	....
Baltimore, del.	32.22	....	....	....
Boston, del.	31.62	....	....	....
Chicago, del.	30.72	....	....	....
Cincinnati, del.	30.94	30.06	....	....
Cleveland, del.	30.62	29.74	....	....
Newark, N. J., del.	32.82	....	....	....
Philadelphia, del.	32.05	31.55	....	....
St. Louis, del.	30.62	31.54	....	....
Buffalo, base	30.50	30.00	31.50	31.00
Boston, del.	36.51	36.01	37.51	37.01
Rochester, del.	32.03	....	33.03	32.53
Syracuse, del.	32.58	....	33.58	33.08
Chicago, base	30.50	30.00	31.00	30.50
Milwaukee, del.	31.73	31.23	32.23	31.73
Muskegon, Mich., del.	34.05	....	....	34.05
Cleveland, base	30.50	30.00	31.00	30.50
Akron, Canton, del.	32.04	31.54	32.54	32.04
Detroit, base	30.50	30.00	31.00	30.50
Saginaw, Mich., del.	32.81	32.31	33.31	32.81
Duluth, base	31.00	30.50	31.50	31.00
St. Paul, del.	33.13	32.63	33.63	33.13
Erie, Pa., base	30.50	30.00	31.50	31.00
Everett, Mass., base	29.50	29.00	30.50	30.00
Boston, del.	30.00	29.50	31.00	30.50
Granite City, Ill., base	30.50	30.00	31.00	30.50
St. Louis, del.	31.00	30.50	....	31.00
Neville Island, Pa., base	30.50	30.00	31.00	30.50
*Pittsburgh, del., N&S. sides	31.27	30.77	31.77	31.27
Provo, Utah, base	28.50	28.00	....	....
Sharpsville, Pa., base	30.50	30.00	31.00	30.50
Steelton, Pa., base	31.50	31.00	32.50	32.00
Swedeland, Pa., base	31.50	31.00	32.50	32.00
Philadelphia, del.	32.43	31.93	....	32.93
Toledo, O., base	30.50	30.00	31.00	30.50
Cincinnati, del.	33.78	33.26	34.26	33.78
Troy, N. Y., base	31.50	....	....	31.00
Youngstown, O., base	30.50	30.00	31.00	30.50
Mansfield, O., del.	32.66	32.16	33.16	32.66

* To Neville Island base add: 61c for McKees Rocks, Pa.; 93c Lawrenceville, Homestead, McKeesport, Ambridge, Monaco, Aliquippa; 97c (water), Monongahela; $1.24, Oakmont, Verona; $1.38, Brackenridge.

Exceptions to above prices: Kaiser-Frazer Parts Corp., Struthers, O., charges 50 cents a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable pig iron.

High Silicon Silvery

6.00-6.50 per cent (base).....$36.00

6.51-7.00	$37.00	9.01- 9.50	42.00
7.01-7.50	38.00	9.51-10.00	43.00
7.51-8.00	39.00	10.01-10.50	44.00
8.01-8.50	40.00	10.51-11.00	45.00
8.51-9.00	41.00	11.01-11.50	46.00

Fob Jackson, O., per gross ton. Buffalo base $1.25 higher. Buyer may use whichever base is more favorable.

Electric Furnace Ferrosilicon: Si 14.01-14.50%, $50, Jackson, O.; $53.25 Keokuk, Iowa; $51.25 Niagara Falls, N. Y. Add $1 a ton for each additional 0.5% Si to 18%; 50c for each 0.5% Mn over 1%; $1 a ton for 0.045% max. phos.

Bessemer Ferrosilicon

Prices same as for high silicon silvery iron, plus $1 per gross ton.

Charcoal Pig Iron

Semi-cold blast, low phosphorus. Fob furnace, Lyles, Tenn. $37.50 (For higher silicon irons a differential over and above the price of base grade is charged as well as for the hard chilling iron, Nos. 5 and 6.)

Gray Forge

Neville Island, Pa. $30.00

Low Phosphorus

Steelton, Pa., Buffalo, Troy, N. Y., Birdsboro, Pa., $36, base; Philadelphia, $37.38, del. Intermediate phosphorus, Central furnace, Cleveland, $33.

Differentials

Basing point prices are subject to following differentials:

Silicon: An additional charge not to exceed 50 cents a ton for each 0.25 per cent silicon in excess of base grade (1.75% to 2.25%).

Phosphorus: A reduction of 38 cents a ton for phosphorus content of 0.70 per cent and over.

Manganese: An additional charge not to exceed 50 cents a ton for each 0.50 per cent, or portion thereof, manganese in excess of 1%.

Nickel: An additional charge for nickel content as follows: Under 0.50%, no extra; 0.50% to 0.74%, inclusive, $2 a ton; for each additional 0.25% nickel, $1 a ton.

Refractories

Per 1000, fob shipping point
Net Prices

Fire Clay Brick

Super Duty

Pa., Mo., Ky.	$81.00

High Heat Duty

Pa., Ill., Md., Mo., Ky.	65.00
Ala., Ga.	65.00
N. J.	70.00

Intermediate Heat Duty

Ohio	57.00
Pa., Ill., Md., Mo., Ky.	59.00
Ala., Ga.	51.00
N. J.	62.00

Low Heat Duty

Pa., Md., Ohio	51.00

Malleable Bung Brick

All bases	75.00

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry Press	42.00
Wire Cut	40.00

Silica Brick

Pennsylvania	65.00
Joliet, E. Chicago	74.00
Birmingham, Ala.	65.00

Magnesite

Domestic dead-burned grains, net ton, fob Chewelah, Wash.

Bulk	22.00
Bags	26.00

Basic Brick

Net ton, fob Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	54.00
Chem. bonded chrome	54.00
Magnesite brick	76.00
Chem. bonded magnesite	65.00

Fluorspar

Metallurgical grade, fob shipping point in Ill., Ky., net tons, carloads, effective CaF_2 content, 70% or more, $33; 65% to 70%, $32; 60% to 65%, $31; less than 60%, $30.

Open Market Prices of Leading Ferroalloy Products

(Prices increased, effective Jan. 1, on contract sales, on ferrosilicon alloys; ganese high-carbon ferrochrome; siliconmanganese; chromium, silicon and manbriquets.)

Spiegeleisen: 19-21% carlot per gross ton, Palmerton, Pa., $40; Pittsburgh, $40.50; Chicago, $40.60.

Ferromanganese, standard: 78-82% c.l. gross ton, duty paid, $135 fob cars, Baltimore, Philadelphia or New York, whichever is most favorable to buyer, Rockdale or Rockwood, Tenn. (where Tennessee Products Co. is producer), Birmingham, Ala. (where Sloss-Sheffield Steel & Iron Co. is producer); $140 fob cars, Pittsburgh (where Carnegie-Illinois Steel Corp. is producer); add $6 for packed c.l., $10 for ton, $13.50 for less ton; $1.70 for each 1%, or fraction contained manganese over 82% or under 78%.

Ferromanganese, low carbon: Eastern zone: Special, 21c; regular, 20.50c; medium, 14.50c; central zone: special, 21.30c; regular, 20.80c; medium, 14.80c; western zone: Special, 21.55c; regular, 21.05c; medium, 15.75c. Prices are per pound contained Mn, bulk carlot shipments, fob shipping point, freight allowed. Special low-carbon has content of 90% Mn, 0.10% C, and 0.06% P.

Ferromanganese Briquets: (Weight approx. 3 lb and containing exactly 2 lb Mn) per lb of briquets. Contract, carlots, bulk 0.0605c, packed 0.063c, tons 0.0655c, less 0.068c, eastern, freight allowed: 0.063c, 0.0655c, 0.0755c and 0.078c, central; 0.066c, 0.0685c, 0.0855c and 0.088c, western; spot up 0.25c.

Ferrotungsten: Spot 10,000 lb or more, per lb contained W, $1.90; contract, $1.88; freight allowed as far west as St. Louis.

Ferrotitanium: 40-45%, R.R. freight allowed, per lb contained Ti: ton lots $1.23; less-ton lots $1.25; eastern. Spot up 5c per lb.

Ferrotitanium: 20-25%, 0.10 maximum carbon; per lb contained Ti; ton lots $1.35; less-ton lots $1.40 eastern. Spot up 5c per lb.

Ferrotitanium, High-Carbon: 15-20% contract basis, per net ton, fob Niagara Falls, N. Y., freight allowed to destination east of Mississippi river and north of Baltimore and St. Louis, 6.8% C $142.50; 3-5% C $157.50.

Ferrovanadium: V 35-55%, contract basis, per lb contained V, fob producers plant with usual freight allowances; open-hearth grade $2.70; special grade $2.80; highly-special grade $2.90.

Ferromolybdenum: 55-75% per lb, contained Mo, fob Langeloth and Washington, Pa., furnace, any quantity 95.00c.

Ferrophosphorus: 17-19%, based on 18% P content with unitage of $3 for each 1% of P above or below the base; gross tons per carload fob sellers' works, with freight equalized with Rockdale, Tenn.; contract price $58.50, spot $62.25.

Ferrosilicon: Contract, lump, packed; eastern zone quotations: 90-95% c.l. 12.65c, ton lots 13.10c, smaller lots 13.50c; 80-90% c.l. 10.35c, ton lots 10.85c, smaller lots 11.35c; 75% c.l. 9.40c, ton lots 9.95c, smaller lots 10.45c; 50% c.l. 7.90c, ton lots 8.50c, smaller lots 9.10c. Prices are fob shipping point, freight allowed, per lb of contained Si. Spot prices 0.25c higher on 80-90%, 0.30c on 75%, 0.45c on 50%. Deduct 0.85c for bulk carlots.

Ferroboron: (B 17.50% max. and C 1.50% max., Al 0.50% max. and C 0.50% max.) per lb of alloy contract ton lots $1.20, less ton lots $1.30, eastern, freight allowed; $1.2075 and $1.3075 central; $1.229 and $1.329, western; spot add 5c.

Ferrocolumbium: 50-60% per lb contained columbium in gross ton lots, contract basis, R. R. freight allowed, eastern zone, $2.25; less-ton lots $2.30. Spot prices up 10 cents.

Ferrochrome: Contract, lump, packed; **high carbon,** eastern, zone, c.l. 15.05c, ton lots 15.55c; central zone, add 0.40c and 0.65c; western zone, add 0.5c and 1.85c; **high carbon, high nitrogen,** add 5c to all high carbon ferrochrome prices. Deduct 0.55c for bulk carlots. Spot prices up 0.25c.

Low carbon, eastern zone, bulk, c.l., max. 0.06% C 23c; 0.1% 22.50c, 0.15% 22c, 0.2% 21.50c, 0.5% 21c, 1% 20.50c, 2% 19.50c, add 1c for 2000 lb to c.l.; central zone, add 0.4c for bulk, c.l., and 0.65c for 2000 lb to c.l.; western zone, add 0.5c for bulk, c.l., and 1.85c for 2000 lb to c.l.; carload packed differential 0.45c. Prices are per pound of contained Cr, fob shipping points.

Low carbon, high nitrogen: Add 2c to low carbon ferrochrome prices. For higher nitrogen low carbon, add 2c for each 0.25% of nitrogen over 0.75%.

Ferrochrome, Special Foundry: (Cr 62-66%, C above 5-7%.) Contract, lump packed, eastern zone, freight allowed, c.l. 15.60c, ton lots 16.10c, less than ton 16.75c; central zone, add 0.40c for c.l. and 0.65c for smaller lots; western zone, add 0.5c for c.l. and 1.85c for smaller lots. Deduct 0.55c for bulk carlots.

S. M. Ferrochrome, high carbon: (Cr 60-65%, Si, Mn and C 4-6% each.) Contract, lump, packed, eastern zone, freight allowed, c.l. 16.15c, ton lots 16.65c, less ton 17.30c; central zone, add 0.40c for c.l. and 0.65c for smaller lots; western zone, add 0.5c for c.l. and 1.05c for smaller lots. Prices are per lb of contained chromium; spot prices 0.25c higher. Deduct 0.55c for bulk carlots.

S. M. Ferrochrome, low carbon: (Cr 62-66%, Si 4-6%, Mn 4-6% and C 1.25% max.) Contract, carlot, bulk, 20.00c, packed 20.15c; ton lots 21.00c, less ton lots 22.00c eastern, freight allowed, per pound contained chromium, 20.40c, 20.50c, 20.95c and 22.65c, central; 21.00c, 21.45c, 22.85c and 23.85c, western; spot up 0.25c.

Ferrochrome Briquets: Containing exactly 2 lb Cr, packed eastern zone, c.l. 9.50c, ton lots 9.50c less than ton 10.10c, central zone, add 0.3c for c.l. and 0.5c for smaller lots; western zone, add 0.70c for c.l. and 2c for smaller lots. Deduct 0.30c for bulk carlots. Prices per lb of briquets; spot prices 0.25c higher.

Chromium Metal: 97% min. chromium, max. 0.50% carbon, eastern zone, per lb contained chromium bulk, c.l., 79.50c, 2000 lb to c.l. 80c, central 81c and 82.60c; western 82.25c and 84.75c fob shipping point, freight allowed.

Chromium-Copper: (Cr 8-11%, Cu 88-90%, Fe 1% max., Si 0.50% max.) contract, any quantity, 45c, eastern, Niagara Falls, N. Y., basis, freight allowed to destination, except to points taking rate in excess of St. Louis rate to which equivalent of St. Louis rate will be allowed; spot up 2c.

Calcium metal; cast: Contract ton lots or more $1.35, less $1.60, pound of metal; $1.36 and $1.61

central, $1.40 and $1.65, western; spot up 5c.

Calcium-Manganese-Silicon: (Ca 16-20%, Mn 14-18% and Si 53-59%), per lb. of alloy. Contract, carlots, 15.50c, ton lots 16.50c and less 17.00c, eastern, freight allowed; 16.00c, 17.35c, and 17.85c, central; 18.05c, 19.10c and 19.60c western; spot up 0.25c.

Calcium - Silicon: (Ca 30-35%, Si 60-65% and Fe 3.00% max.), per lb of alloy. Contract, carlot, lump 13.00c, ton lots 14.50c, less 15.50c eastern, freight allowed; 13.50c, 15.25c and 16.25c central; 15.55c, 17.40c and 18.40c, western; spot up 0.25c.

Silicon Metal: Min. 97% Si and max. 1% Fe, eastern zone, bulk, c.l., 12.90c; 2000 lb to c.l., 13.45c; central, 13.20c and 13.90c; western, 13.85c and 16.80c; min. 96% Si and max. 2% Fe, eastern, bulk; c.l., 12.50c, 2000 lb to c.l., 13.10c; central, 12.80c and 13.55c; western, 13.45c and 16.50c, fob shipping point, freight allowed. Price per lb contained Si.

Silicomanganese, containing exactly 2 lb Mn and about ½ lb Si, eastern zone, bulk, c.l. 5.80c, ton lots 6.35c; central zone, add 0.25c for c.l. and 1c for ton lots; western, add 0.55c for c.l. and 0.20c for ton lots. **Ferrosilicon,** weighing about 5 lb and containing exactly 2 lb Si, or about 2⅛ lb and containing exactly 1 lb Si, packed, eastern zone, c.l. 3.90c, ton lots 4.15c, less ton lots 4.45c; central zone, add 0.15c for c.l. and 0.40c for smaller lots; western zone, add 0.30c for c.l. and 0.45c for smaller lots. Prices are fob shipping point, freight allowed; spot prices 0.25c higher. Deduct 0.30c for bulk carlots.

Manganese Metal: (Min. 96% Mn, max. 2% Fe), per lb of metal, eastern zone, bulk, c.l., 30c, 2000 lb to c.l., 32c, central, 30.25c, and 33c; western, 30.55c and 35.05c.

Electrolytic Manganese: 99.9% plus, fob Knoxville, Tenn., freight allowed east of Mississippi on 250 lb or more: Carlots 32c, ton lots 34c, drum lots 36c, less than drum lot 38c. Add 1½c for hydrogen-removed metal.

Manganese-Boron: (Mn 75% approx., B 15-20%, Fe 5% max., Si 1.50% max. and C 3% max.) per lb of alloy. Contract ton lots, $1.89, less $2.01, eastern; freight allowed; $1.903 and $2.023, central, $1.935 and $2.055 western; spot up 5c.

Nickel-Boron: (B 15-18%, Al 1% max., Si 1.50% max., C 0.50% max., Fe 3% max., Ni, balance), per lb of alloy. Contract, 5 tons or more, $1.90, 1 ton to 8 ton, $2.00, less than ton $2.10, eastern, freight allowed; $1.9125, $2.0125 and $2.1125, central; $1.9445, $2.0445 and $2.1445, western; spot same as contract.

Borosil: 3 to 4% B, 40 to 45% Si, $6.25 lb contained B, fob Philo, O., freight not exceeding St. Louis rate allowed.

Bortam: B 1.5-1.9%, ton lots, 45c lb; less-ton lots, 50c lb.

Carbortam: B 0.90 to 1.15% net ton to carload, 8c per lb fob Suspension Bridge, N. Y., freight allowed same as high-carbon ferrotitanium.

Silicaz Alloy: (Si 35-40%, Ca 9-11%, Al 5-7%, Zr 5-7%, Ti 9-11% and B 0.55-0.75%), per lb of alloy contract, carlots 25.00c, ton lots 26.00c, less ton lots 27.00c, eastern, freight allowed, 25.50c, 26.75c and 27.75c, central; 27.50c, 28.90c and 29.90c, western; spot up 0.25c.

Silvaz Alloy: (Si 35-40%, Va 9-11%, Al 5-7%, Zr 5-7%, Ti 9-11% and B 0.55-0.75%), per lb of alloy. Contract, carlots 58.00c, ton lots 59.00c, less 60.00c, eastern freight allowed; 58.50c, 59.75c and 60.75c, central; 60.50c, 61.90c and 62.90c, western; spot up 0.25c.

SMZ Alloy: (Si 60-65%, Mn 5-7%, Zr 5-7% and Fe approx. 20%) per lb of alloy contract carlots 11.50c, ton lots 12.00c, less 12.50c, eastern zone, freight allowed; 12.00c, 12.85c and 13.35c central zone; 14.05c, 14.60c and 15.10c, western; spot up 0.25c.

CMSZ Alloy 4: (Cr 45-49%, Mn 4-6%, Si 18-21%, Zr 1.25-1.75% and C 3.00-4.50%). Contract carlots, bulk, 11.00c and packed 11.50c; ton lots 12.00c; less 12.50c, eastern, freight allowed; 11.50c and 12.00c, 12.75c, 13.25c, central; 13.50c and 14.00c, 14.75c, 15.25c, western; spot up 0.25c.

CMSZ Alloy 5: (Cr 50-56%, Mn 4-6%, Si 13.50-16.00%, Zr 0.75-1.25%, C 3.50-5.00%) per lb of alloy. Contract, carlots, bulk, 10.75c, packed 11.25c, ton lots 11.75c, less 12.25c, eastern, freight allowed; 11.25c, 11.75c, 12.50c and 13.00c, central; 13.25c and 13.75c, 14.50c and 15.00c, western; spot up 0.25c.

Zirconium Alloy: 12-15%, per lb of alloy, eastern contract, carlots, bulk, 4.60c, packed 4.80c, ton lots 4.80c, less tons 5c, carloads, bulk, per gross ton $102.50; packed $107.50; ton lots $108; less-ton lots $112.50. Spot up $5 per ton.

Zirconium Alloy: Zr 35-40%, eastern, contract basis, carloads in bulk or package, per lb of alloy 14.00c; gross ton lots 15.00c; less-ton lots 16.00c. Spot up ¼c.

Alsifer: (Approx. 20% Al, 40% Si, 40% Fe) contract basis fob Niagara Falls, N. Y., lump per lb 6.25c; ton lots 6.75c; less 7.25c. Spot up ½c.

Simanal: (Approx. 20% each Si, Mn, Al) Packed, lump, carload 9c, ton lots 9.25c, less-ton lots 9.75c per lb alloy; freight not exceeding St. Louis rate allowed.

Tungsten Metal Powder: Spot, not less than 97%, $2.50-$2.60; freight allowed as far west as St. Louis.

Grainal: Vanadium Grainal No. 1 87.5c; No. 6, 60c; No. 79, 45c; all fob Bridgeville, Pa., usual freight allowance.

Vanadium Pentoxide, technical grade: Fused, approx. 89-92% V_2O_5 and 5.84% NA_2O; or air dried, 83-85% V_2O_5 and 5.15% NA_2O, $1.10 per lb contained V_2O_5, fob plant, freight allowed on quantities of 25 lb and over to St. Louis.

OPEN MARKET PRICES, IRON AND STEEL SCRAP

Prices are dollars per gross ton, including broker's commission, delivered at consumer's plant except where noted.

OPEN HEARTH AND BLAST FURNACE GRADES

	—Heavy Melting—		No. 1	—Bundles—			Machine Shop	Mixed Borings,	Short Shovel	Cast Iron
	No. 1	No. 2	Busheling	No. 1	No. 2	No. 3	Turnings	Turnings	Turnings	Borings
Pittsburgh	32.50	32.50	32.50	32.50	32.50	32.50	26.00–26.50	26.00–26.50	28.00–28.50	27.00–27.50
Philadelphia	30.50–31.50	30.50–31.50	30.50–31.50	30.50–31.50	30.50–31.50	28.50–29.00	23.50–24.00	23.50–24.00	23.50–24.00	23.50–24.00
Chicago	30.00	30.00	30.00	30.00	30.00	28.00	25.00	25.00	28.25	26.00
Cleveland	32.50	32.50	32.50	32.50	32.50	30.50	27.00	27.00	27.00	25.00
Cincinnati	29.00	29.00	28.00	29.00	29.00	....	22.50	21.00	24.00	22.50
*Boston	25.00–26.00	25.00–26.00	25.00–26.00	25.00–26.00	25.00–26.00	23.00–24.00	17.50–18.50	17.35–17.85	20.00–21.00	17.35
†New York	25.50	25.50	25.50	25.50	25.50	23.50	20.50	20.50	22.50	....
Buffalo	29.00	29.00	29.00	29.00	29.00	27.00	19.50	19.50	22.00	20.50
‡Detroit	27.50–28.00	....	27.50–28.00	27.50–28.00	27.50–28.00	25.50–26.00	20.50–21.00	20.50–21.00	22.50–23.00	22.50–23.00
Valley	32.50	32.50	....	32.50	....	....	25.00	....	26.00	25.00
Mansfield	....	....	....	....	....	....	§24.00	....	....	....
St. Louis	22.22	22.22	....	....	....	....	14.72	....	16.72	....
Birmingham	22.00–22.50	22.00–22.50	22.00–22.50	22.00–22.50	22.00–22.50	20.00–20.50	14.50–15.00	14.50–15.00	16.50–17.00	15.50–16.00
San Francisco	19.50	19.50	19.50	19.50	19.50	10.00	8.00	....	....	....
Seattle	17.00	17.00	....	17.00	....	....	9.50	9.50	....	....
Los Angeles	16.50	15.50	....	14.50	14.50	....	8.00	8.00	....	....

ELECTRIC FURNACE, FOUNDRY AND SPECIAL GRADES

	Bar Crops and Plate	Cast Steel	Punchings and Plate Scrap	Electric Furnace Bundles	Heavy Turnings	Alloy Free Turnings	Cut Structural and Plate Scrap 1 ft and under	Cut Structural and Plate Scrap 2 ft and under	No. 1 Chemical Borings	Tin Can Bundles
Pittsburgh	34.50–35.00	34.50–35.00	34.50–35.00	33.00–33.50	31.00–31.50	29.00–29.50	34.50–35.00	34.50–35.00	31.50–32.00	28.00–28.50
Philadelphia	34.50–35.00	34.50–35.00	34.50–35.00	32.00–32.50	31.50–32.00	....	34.00–35.00	34.00–35.00	31.00–31.50	....
Chicago	26.25	26.25	26.25	24.75	23.25	....	26.25	25.75	....	....
Cleveland	35.00	35.00	35.00	35.00	32.50	27.00	34.50	34.50	27.00	24.50
*Boston	29.35	29.35–29.85	29.35–29.85	29.35	26.35	25.35	28.85	28.85	25.85	....
†New York	....	....	30.00	26.50	....	....	30.00	30.00	24.50	....
Buffalo	....	27.00	30.00–31.00	28.50	22.50	19.75	28.50	28.50	22.75	....
‡Detroit	....	....	28.50–30.50	28.50–29.50	....	....	....	....	....	....
Birmingham	24.50–25.00	24.50–25.00	24.50–25.00	....	....	....	24.50–25.00	24.50–25.00	....	....
San Francisco	18.00	18.00	....	....	....	8.00	20.50	20.00	....	17.00

STEEL GRADES OF RAILROAD ORIGIN

	No. 1 Heavy Melting R.R. Steel	Railroad Malleable	Rails: Axles	Rails: Rerolling	Rails: Random Lengths	Rails: Cut 3-ft and under	Cut 18-in. and under	Railroad Specialties	Uncut Tires	Angles, Splice Bars
Pittsburgh	33.50	34.00	38.50	35.00	33.00	35.00	36.00	36.00–36.50	36.00	36.00
Chicago	30.00	....	....	34.50–35.00	33.00	32.00	33.25	33.50	....	32.00
Cincinnati	29.00	35.00	....	36.00	36.00	....	40.00	....	....	....
Valley	32.50	....	....	....	....	....	....	....	....	....
St. Louis	....	28.00	27.00	25.00	24.00	27.50	....	....	23.50	23.50
Birmingham	23.00–23.50	....	....	25.50–26.00	24.00–24.50	26.50–27.00	27.50–28.00	....	....	25.50–26.00
San Francisco	....	....	26.50	....	21.00	....	....	....	23.00	....
Seattle	17.00	17.00	....	....	....	....	....	....	....	....

CAST IRON GRADES

	No. 1 Cupola Cast	Charging Box Cast	Heavy Breakable Cast	Stove Plate	Unstripped Motor Blocks	Malleable	Brake Shoes	Clean Auto Cast	No. 1 Wheels	Burnt Cast
Pittsburgh	43.00–44.00	43.00–44.00	43.00–44.00	39.00–40.00	36.00–38.00	40.00–41.00	33.00–34.00	43.00–44.00	38.00–39.00	33.00–34.00
Philadelphia	41.00–42.00	40.00	40.00	....	37.50–38.00	40.00	....	41.00–42.00	41.00	38.00
Chicago	35.00–45.00	....	....	....	....	35.00–45.00	....	35.00–45.00	....	....
Cincinnati	40.00	30.00	32.00	28.00	30.00	....	28.00	40.00	....	....
*Boston	38.00–40.00	36.00–38.00	35.00–37.00	36.00	....	....	....	38.00–40.00	....	....
†New York	37.00–38.00	37.00–38.00	....	....	34.50	32.00	....	....	....	....
Buffalo	35.00–40.00	31.00–35.00	....	33.00–38.00	....	34.00–38.00	....	38.00	32.75–33.25	....
‡Detroit	35.00–37.00	....	28.00–30.00	....	....	....	....	35.00–37.00	....	....
*St. Louis	25.00–30.00	25.22	22.75	27.00	....	....	20.25	32.00	26.00	20.25
Birmingham	30.00	....	25.00	28.00	25.00	....	22.75	....	27.00	....
Seattle	27.50	....	....	23.00	....	....	....	....	24.50	....
Los Angeles	30.00	....	....	....	....	....	....	....	....	....

* Fob shipping point; † fob tracks; ‡ dealers buying prices; § nominal.

NONFERROUS METAL PRICES

Copper: Electrolytic, carlots 19.50c, del. Conn.; Lake, 19.62½c, del. Conn. Dealers may add ¾c for 5000 lb to carload; 1c, 1000-4999 lb; 1½c, 500-999 lb; 2c, 0-499 lb. Casting, 19.25c, refinery, 20,000 lb or more; 19.50c, less than 20,000 lb.

Brass Ingot: 85-5-5-5 (No. 115) 20.50c; 88-10-2 (No. 215) 24.75c; 80-10-10 (No. 305) 23.50c; No. 1 yellow (No. 405) 16.25c; carlot prices, including 25c per 100 lb freight allowance; add ¼c for less than 20 tons.

Zinc: Price western 10.50c, brass special 10.75c, intermediate 11.00c, E. St. Louis; high grade 11.50c, del., carlots. For 20,000 lb to carlots add 0.15c; 10,000-20,000 lb 0.25c; 2000-10,000 lb 0.4c; under 2000 lb 0.50c.

Lead: Common 12.35-12.40, chemical 12.45c, corroding 12.45c, E. St. Louis for carlots; add 5 points for Chicago, Minneapolis-St. Paul, Milwaukee-Kenosha districts; add 15 points for Cleveland - Akron - Detroit area, New Jersey, New York state, Texas, Pacific Coast, Richmond, Indianapolis-Kokomo; add 20 points for Birmingham, Connecticut, Boston - Worcester, Springfield, New Hampshire, Rhode Island.

Primary Aluminum: 99% plus, ingots 15.00c del., pigs 14.00c del.; metallurgical 94% min. 13.50c del. Base 10,000 lb and over; add ½c 2000-9999 lb; 1c less through 2000 lb.

Secondary Aluminum: Piston alloy (No. 122 (type) 17.00c; No. 12 foundry alloy (No. 2 grade) 16.50c; steel deoxidizing grades, notch bars, granulated or shot: Grade 1 (95-97½%) 17.00c; grade 2 (92-95%) 16.25c; grade 3 (90-92%) 15.75c; grade 4 (85-90%) 15.50c. Above prices for 30,000 lb or more; add ¼c 10,000-30,000 lb; ½c 5000-10,000 lb; ¾c 1000-5000 lb; 1¼c less than 1000 lb. Prices include freight at carload rate up to 75c per 100 lb.

Magnesium: Commercially pure (99.8%) standard ingots (4-notch, 17 lb) 20.50c per lb, carlots; 22.50c 100 lb to c.l. Extruded 12-in. sticks 34.00c-38.00c.

Tin: Prices ex-dock, New York in 5-ton lots. Add 1 cent for 2240-11,199 lb, 1½c 1000-2239, 2½c 500-999, 3c under 500. Grade A, 99.8% or higher (includes Straights), 70.00c; Grade B, 99.8% or higher, not meeting specifications for Grade A, with 0.05% max. arsenic, 69.87½c; Grade C, 99.65-99.79% incl. 69.62½c; Grade D, 99.50-99.64% incl., 69.50c; Grade E, 99-99.49% incl. 69.12½c. Grade F, below 99% (for tin content), 69.00c.

Antimony: American bulk carlots fob Laredo, Tex., 99.0% to 99.8% and 99.8% and over but not meeting specifications below, 28.25c; 99.8% and over (arsenic, 0.05% max.; other impurities, 0.1% max.) 28.75c. On producers' sales add ¼c for less than carload to 10,000 lb; ½c for 9999-224 lb; and 2c for 223 lb and less; on sales by dealers, distributors and jobbers add ½c, 1c, and 3c, respectively.

Nickel: Electrolytic cathodes, 99.9%, base sizes at refinery, unpacked 35c lb; 25 lb pigs produced from electrolytic cathodes 36.50c lb; shot produced from electrolytic cathodes 37.50c lb; "F" nickel shots or ingots for additions to cast iron 35.50c lb. Prices include import duty.

Mercury: Open market, spot, New York, $88-$92 per 76-lb flask.

Arsenic: Prime, white, 99%, carlots, 4.00c lb.

Beryllium-Copper: 3.75-4.25% Be, $14.75 per lb contained Be.

Cadmium: Bars, ingots, pencils, pigs, plates, rods, slabs, sticks, and all other "regular" straight or flat forms $1.50 lb, del.; anodes, balls, discs and all other special or patented shapes, $1.55.

Cobalt: 97-98%, $1.50 lb for 550 lb (keg); $1.52 lb for 100 lb (case); $1.57 lb under 100 lb.

Gold: U. S. Treasury, $35 per ounce.

Indium: 99.9%, $2.25 per troy ounce.

Silver: Open market, N. Y. 83.75c per ounce.

Platinum: $58.00-$65.00 per ounce.

Palladium: $24 per troy ounce.

Iridium: $120 per troy ounce.

Rolled, Drawn, Extruded Products

(Copper and brass product prices based on 19.50c, Conn., for copper. Freight prepaid on 100 lb or more.)

Sheet: Copper 30.93c; Yellow brass 27.53c; commercial bronze, 95% 31.07c, 90% 30.56c; red brass, 85% 29.53c, 80% 29.02c; best quality 28.44c; Everdur, Duronze, Herculoy or equiv., cold-drawn, 35.79c; nickel silver, 18%, 39.82c; phosphor bronze, grade A, 5%, 48.82c.

Rods: Copper, hot rolled 27.28c, cold drawn 28.28c; yellow brass, free cutting, 22.28c, not free cutting 27.22c; commercial bronze, 95% 30.76c, 90% 30.25c; red brass, 85% 29.22c, 80% 28.71c; best quality 28.13c.

Seamless Tubing: Copper 30.97c; yellow brass 30.29c; commercial bronze 90% 32.97c; red brass 85% 32.19c, 80% 31.68c; best quality brass 30.85c.

Copper Wire: Bare, soft, fob eastern mills, carlots 25.52c, less carlots 26.02c; weatherproof, fob eastern mills carlot 26.42c, less carlots 26.92c; magnet, delivered, carlots 28.93c, 15,000 lb or more 29.18c, less carlots 29.68c.

Aluminum Sheets and Circles: 2s and 3s flat mill finish, base 30,000 lb or more del.; sheet widths as indicated; circle diameter 9" and larger:

Gage	Width	Sheets	Circles
.249"-7	12"-48"	22.70c	25.20c
8-10	12"-48"	23.20c	25.70c
11-12	26"-48"	24.20c	27.00c
13-14	26"-48"	25.20c	28.50c
15-16	26"-48"	26.40c	30.40c
17-18	26"-48"	27.90c	32.90c
19-20	24"-42"	29.80c	35.30c
21-22	24"-42"	31.70c	37.20c
23-24	3"-24"	25.60c	29.20c

Lead Products: Prices to jobbers: Full sheets 15.80c, 140 sq ft rolls; add per hundredweight, 25c, 80 to 140 sq ft; 50c, 20 to 80 sq ft; 75c, 10 to 20 sq ft.
Pipe: Full coils 15.05c; cut coils 15.30c.
Lead Traps and Bends: List plus 35%.

Zinc Products: Sheet, 15.75c, fob mill, 36,000 lb and over. Ribbon zinc in coils, 14.75c, fob mill, 36,000 lb and over.

PLATING MATERIALS

Chromic Acid: 99.75%, flake, del., carloads 16.25c; 5 tons and over 16.75c; 1-5 tons 17.25c; 400 lb to 1 ton 17.75c; under 400 lb 18.25c.

Copper Anodes: In 500-lb lots, fob shipping point, freight allowed, cast oval over 15 in., 36.87½c; flat untrimmed, 36.87½c; electro-deposited, 30.62½c.

Copper Carbonate: 52-54% metallic Cu, 250 lb barrels nom.

Copper Cyanide: 70-71% Cu, 100-lb kegs or bbls. nom., fob, Niagara Falls.

Sodium Cyanide: 96%, 200-lb drums 15.00c; 10,000-lb lots 13.00c fob Niagara Falls.

Nickel Anodes: 500-2999 lb lots; cast and rolled carbonized 51.00c; rolled depolarized 52.00c.

Nickel Chloride: 100-lb kegs or 275-lb bbls 18.00c lb, del.

Tin Anodes: 1000 lb and over nom. del.; 500-999 nom.; 200-499 nom.; 100-199 nom.

Tin Crystals: 400 lb bbls nom., fob Grasselli, N. J.; 100-lb kegs nom.

Sodium Stannate: 100 or 300-lb drums nom. del.; ton lots nom.

Zinc Cyanide: 100-lb kegs or bbls 33.00c fob Niagara Falls.

SCRAP METALS

BRASS MILL ALLOWANCES

Prices for less than 15,000 lb fob shipping point. Add ¾c for 15,000-40,000 lb; 1c for 40,000 or more.

	Clean Heavy	Rod Ends	Clean Turnings
Copper	17.125	17.125	16.375
Yellow brass	13.750	13.250	12.875
Commercial Bronze			
95%	15.875	15.625	15.125
90%	15.750	15.500	15.000
Red brass			
85%	15.500	15.250	14.750
80%	15.375	15.125	14.625
Best Quality (71-79%)	14.625	14.375	.....
Muntz metal	12.875	12.625	12.125
Nickel silver, 5%	14.500	14.250	7.250
Phos. bronze, A, B	18.125	17.875	16.875
Naval brass	13.250	13.000	12.500
Manganese bronze	13.250	13.000	12.375

BRASS INGOT MAKERS' BUYING PRICES

(Cents per pound, fob shipping point, carload lots)

No. 1 copper 17.00, No. 2 copper 16.00, light copper 15.00, composition red brass 16.00, auto radiators 13.00, heavy yellow brass 11.50, brass pipe 12.00.

REFINERS' BUYING PRICES

(Cents per pound, delivered refinery, carload lots)

No. 1 copper, 17.25-17.50c; No. 2 copper 16.25c; light copper 15.00-15.25c; refinery brass (60% copper), per dry copper content, 14.87½-15.25c.

DEALERS' BUYING PRICES

(Cents per pound in ton lots or more)

Copper and Brass: Heavy copper and wire, No. 1 15.50-16.00; No. 2 14.50-15.00; light copper 13.50-14.00, No. 1 composition red brass 14.00-14.50, No. 1 composition turnings 13.00-13.50, mixed brass turnings 9.50-10.00, new brass clippings 13.00-13.50, No. 1 brass rod turnings 11.50-12.00, light brass 8.00-8.50, heavy yellow brass 10.00-10.50, new brass rod ends 12.00-12.25, auto radiators, unsweated, 11.00-11.50, clean red car boxes 12.50-13.00, cocks and faucets 11.75-12.00, brass pipe 11.50-11.75.

Lead: Heavy lead 10.75-11.00, battery plates 6.00-6.25, linotype and stereotype 13.00-13.50, electrotype 11.00-11.50, mixed babbitt 12.00-12.50, solder joints 13.50-14.00.

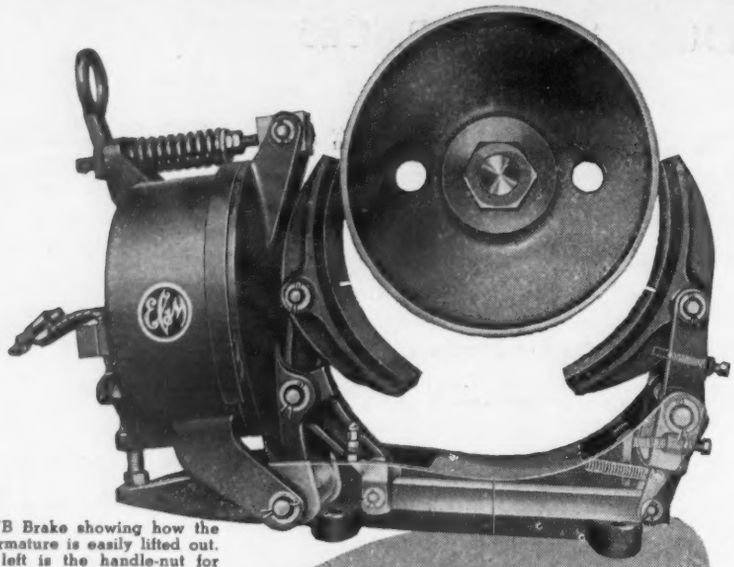
Zinc: Old zinc 5.50-6.00, new die cast scrap 5.50-6.00, old die cast scrap 4.00-4.50.

Tin: No. 1 pewter 44.00-45.00, block tin pipe 60.00-62.00, auto babbitt 35.00-36.00, No. 1 babbitt 35.00-38.00, siphon tops 38.00-40.00.

Aluminum: Clippings, 2S, 10.00-10.25, old sheets 7.50-7.75, crankcases 7.50-8.00, turnings 4.00-4.25, pistons, free of struts, 6.75-7.00.

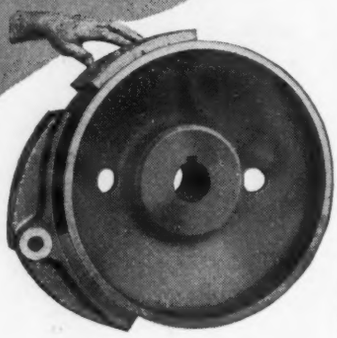
Nickel: Anodes 19.50-20.00, turnings 16.50-17.50, rod ends 19.00-20.00.

Monel: Clippings 14.00-15.00, turnings 9.00, old sheet 12.00-13.00, rods 12.50-13.00, castings 10.00.



Type WB Brake showing how the motor armature is easily lifted out. At top left is the handle-nut for compressing the spring when removing motor armature, changing brake shoes and for manual control.

Long Life Brakes for A-C and D-C Motors by EC&M

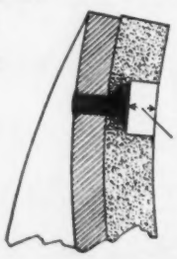


The brake lining is molded to match curvature of wheel and shoe.

These Type WB Brakes for a.c. and d.c. service have a block type lining which is both thick and tough.

Furthermore, due to the process of manufacture, the blocks have proper frictional quality *throughout the entire thickness* permitting uniform and complete wear down to rivet heads. And since the material is non-compressionable, brake adjustments are infrequent.

EC&M Type WB Brakes are built in several sizes. They can be supplied with series or shunt-wound operating coils for direct current motors. On alternating current service, they are supplied in shunt-wound form for use with a compact rectifier-unit. Send for Bulletins 1004 and 1006 describing these long life brakes.



Actual wearing thickness, between rivet heads and brake wheel, is 1/8" on the smallest size to 1/2" on the largest size.

THE ELECTRIC CONTROLLER & MFG. CO.
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Sheets, Strip . . .

Carnegie-Illinois revises schedule of extras on hot-rolled sheets

Sheet & Strip Prices, Page 338

Pittsburgh — Carnegie-Illinois Steel Corp. has issued a revision to its hot-rolled sheet extra card establishing the following standard classification by size of flat-rolled carbon steel:

Over 48-in. wide and lighter than 0.1875-in. thick are sheets; plates, if 0.1875-in. and thicker. In width range over 12 to 48-in. inclusive, any thickness lighter than 0.2500-in. is a sheet; heavier, plates.

The size extra card for hot-rolled sheets now includes a separate schedule of extras for thickness 0.1874 to 0.1719-in. and from 0.2499 to 0.1875-in. for 7 gage and heavier. In thickness range 0.2499 to 0.1875-in. there is a size extra of 10 cents per 100 pounds for widths over 12-in. to 48-in. inclusive; over 48-in. plate size extra list applies.

Producers are making a study of the electrical sheet price structure. Some of the smaller mills are eager to have lower grades advanced, but no action has been taken.

Under the Office of Temporary Control policy, rated tonnage certificates are expected to be issued only for military and essential civilian "hardship" cases. Frequent disruption to mill production schedules throughout the past year resulted in a substantial carryover tonnage into 1947 in some instances representing over one month's output.

Chicago—Higher steel prices are focusing more attention upon the unbalanced position of manufacturing industries, inventories, and in all probability they will result in maintenance of closer inventory control. Already there is evi-

Automobile Production

Passenger Cars and Trucks—U. S. and Canada

Estimates by Ward's Automotive Reports

	1946	1941
January	121,934	524,073
February	84,141	509,332
March	140,777	533,878
April	248,318	489,856
May	247,620	545,355
June	216,637	546,278
July	331,000	468,897
August	359,101	164,793
September	342,727	248,751
October	410,466	401,369
November	380,460	373,892
December	374,210	302,518
Total, 12 mos.	3,257,391	5,108,992
Estimates for week ended:		
Dec. 14	96,887	95,990
Dec. 21	96,754	70,875
Dec. 28	63,955	25,620
Jan. 4	50,000	11,351

° *Preliminary.*

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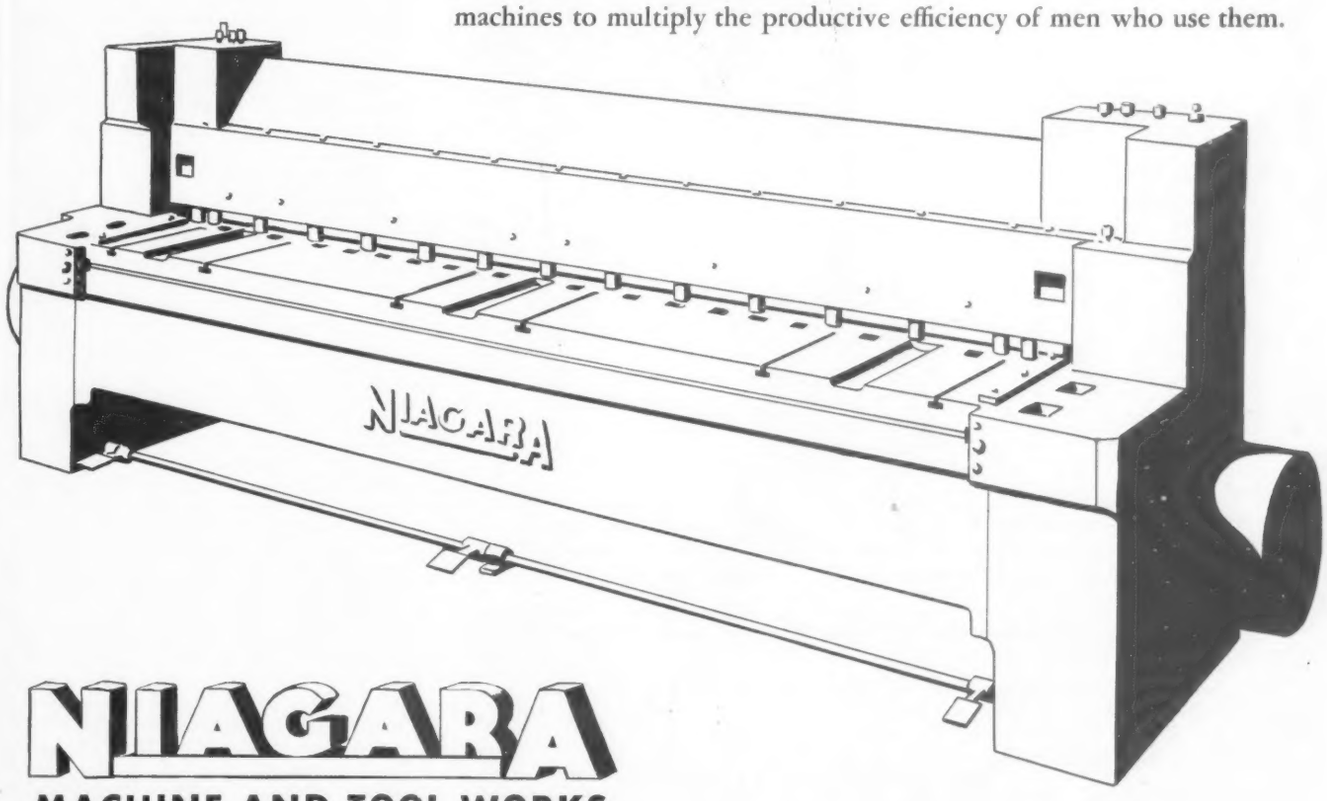
As builders of presses, shears and machines for sheet metal working, the men of Niagara appreciate their opportunity to help American people enjoy the better things of life,—thanks to the ability of Niagara machines to multiply the productive efficiency of men who use them.



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dence that some consumers are cutting back their orders on mill books, but this has not yet developed to the point where it can be called a trend. Most mills report their cancellations normal. The newly imposed extras, devised to place costs where they belong, are also causing customers to review their buying habits to the end that some of these extras can be reduced or eliminated. An example of this is that some users now are accepting standard methods of bundling, loading and marking which formerly they would not consider.

New York—With the freight rate from Sparrows Point now 29 cents, the New York delivered prices on hot-rolled and galvanized sheets are 2.79c and 3.84c, respectively. With the Buffalo rate 41 cents, the delivered price here on cold-rolled sheets is 3.61c.

As all producers are tightly booked up for this quarter and have not opened their books for the second quarter, new buying from the mills is virtually at a standstill. New purchases are confined principally to orders out of warehouse and to scattered surplus tonnages.

St. Louis—Sheet steel production continues hampered by pig scarcities caused by delays and reductions in allocations. Finished steel shipments are six to seven months behind schedule and little prospect exists for improvement before May. Order books for 1947 are not yet open, but 1946 carryover has filled rolling schdeules through the first half. Demand is unabated, with no effective resistance to price rises noted.

Philadelphia — Sheet producers enter the new year with their schedules loaded for the first quarter. This condition would apply, in fact, well into the future were the mills to accept orders for the principal grades for delivery beyond the first quarter. Most sellers look for a stringent market throughout the year. Some new facilities are expected to get under operation within the next few months, but will fall far short of balancing supply with demand.

Due to an advance of 1 cent in the freight rate from Sparrows Point, the governing base for this district on hot-rolled sheets and galvanized sheets, the delivered prices on these grades are now 2.70c, and 3.75c, respectively; and due to an increase of 2 cents in the rate from Pittsburgh, the governing base on cold rolled sheets, the delivered price of this material is 3.58c.

Boston—Sharply higher steel costs confront tack-makers, consumers of around 35,000 tons in New England. On a commodity basis, depending on gage, size and quality, and subject to the hot-rolled sheet card of extras, tack plate basing point is again Pittsburgh, returned to that producing point after several weeks on a Sparrows Point base. Average increase is $10 a ton over the $6.50 the last OPA advance, up $16.50 since late October; to some consumers, depending on loading, freights and other factors, costs will be up to $2 ton higher. Tack plate, usually 30 x 36 inches, frequently is specified in split gages, close tolerance, and requires much shearing and special processing. This grade, a hot-rolled sheet classification, is one of the most important tonnage-wise in the area.

Tack-makers, United Shoe Machinery Corporation, the largest, are becoming concerned as to future supply, now that one of the remaining two mills making this plate, Mahoning Valley Steel Co.,

Niles, O., has been purchased by General Electric Co. Balance and the bulk of tonnage is furnished by Carnegie-Illinois Steel Co., mostly from hand mills, Vandergrift works.

Comparatively new production development is the rolling of this grade on continuous mills, Irving Works. Gage tolerance is a major consideration and until recently production of tacks from stock rolled on any but hand mills was not thought feasible. Tack-makers slit to width and further treat by pickling. Handling each sheet for gage inspection and other factors has made this grade a low margin or profitless product which accounts for the withdrawal of several mills at former prices. Starting Jan. 1, sales distribution of the product will also be changed for bulk of volume consumed. For many years, Carnegie-Illinois Steel Corp. sold tack plate through a distributor, but now sells direct. Substantial part of the tack production goes to the shoe industry, but automobiles, furniture and others also consume large quantities.

Shank steel strip also has advanced to makers of that shoe accessory, impact of the increase appearing largely in new cards of extras, but hiking up costs on this cold-drawn product $5 per ton.

Steel Plates . . .

Plate Prices, Page 339

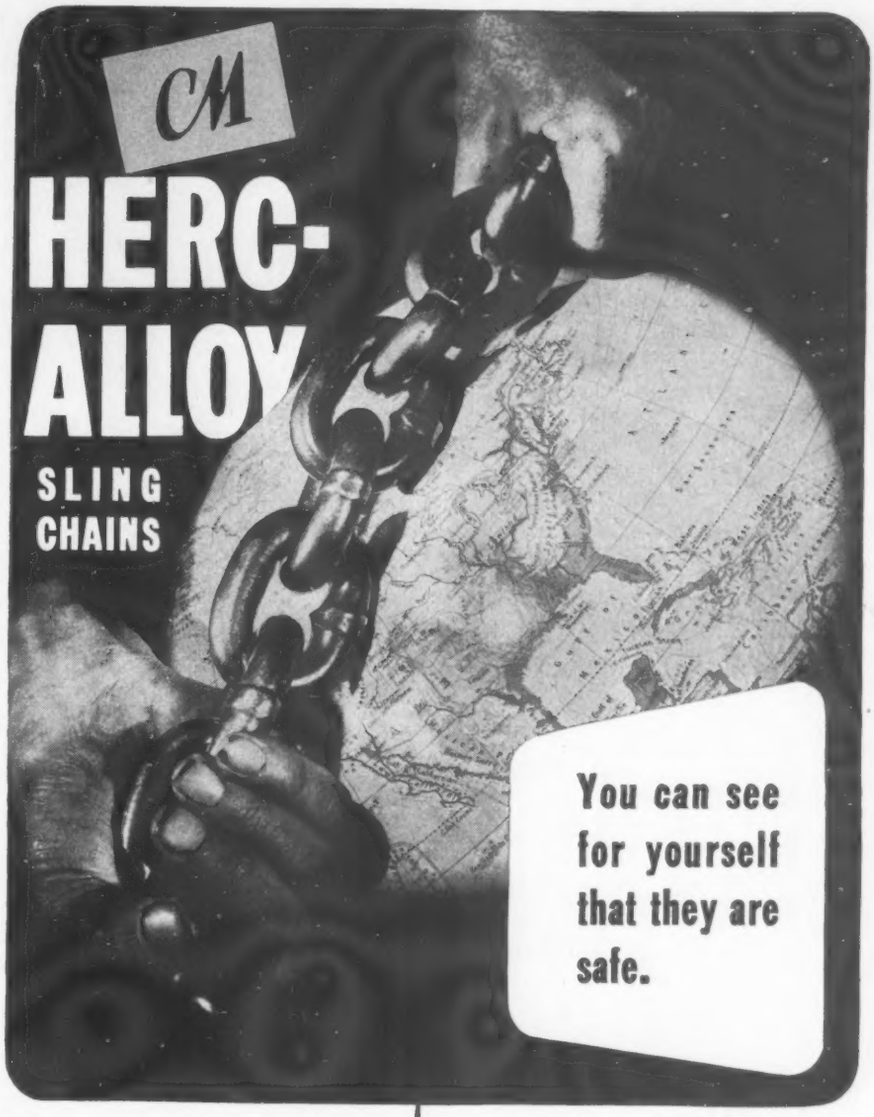
New York — As a result of the increase in freight rates Jan. 1, the new York delivered price on plates is now 2.73c, as against 2.71c previously.

Plate sellers enter the new year with heavy arrearages, amounting to approximately three months operation in some cases, and with the stringency in light gage material particularly pronounced. Some sellers are scheduled well into third quarter, on this light gage tonnage especially. At the same time, at least a couple of producers are selling on a quarterly basis and consequently have no formal commitments beyond first quarter.

With strip plate production at low ebb, involving only a relatively small tonnage, plate production is somewhat in excess of 500,000 tons per month, it is estimated, a figure above the prewar average, however. Ship requirements, which dominated the market during the war, continue to dwindle; on the other hand, miscellaneous tank and equipment fabrication work is tending to take up some of the slack. In fact, this work has been well in excess of trade estimates made at the end of the war. Also there is a good export demand. Unless substantial cancellations develop later, most plate mills could run at virtual capacity throughout the first half, on the basis of present backlog alone.

Philadelphia — Substantial demand for plates marks the turn of the new year. Not only is there good miscellaneous inquiry but substantial lists from abroad, from Norway, Sweden and the Netherlands in particular. Also Italy has come into the market recently for a fairly sizable tonnage, with funds to support her purchases. There, too, has been a pick-up in indirect demand for plates for export. These plates are required for some sizable locomotive orders placed in the district recently for foreign shipment.

The freight rate from Claymont, Del., the governing basing point for this district is up fractionally from 5.8c to 6.00c per hundred pounds.



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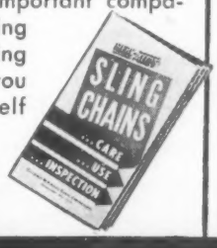

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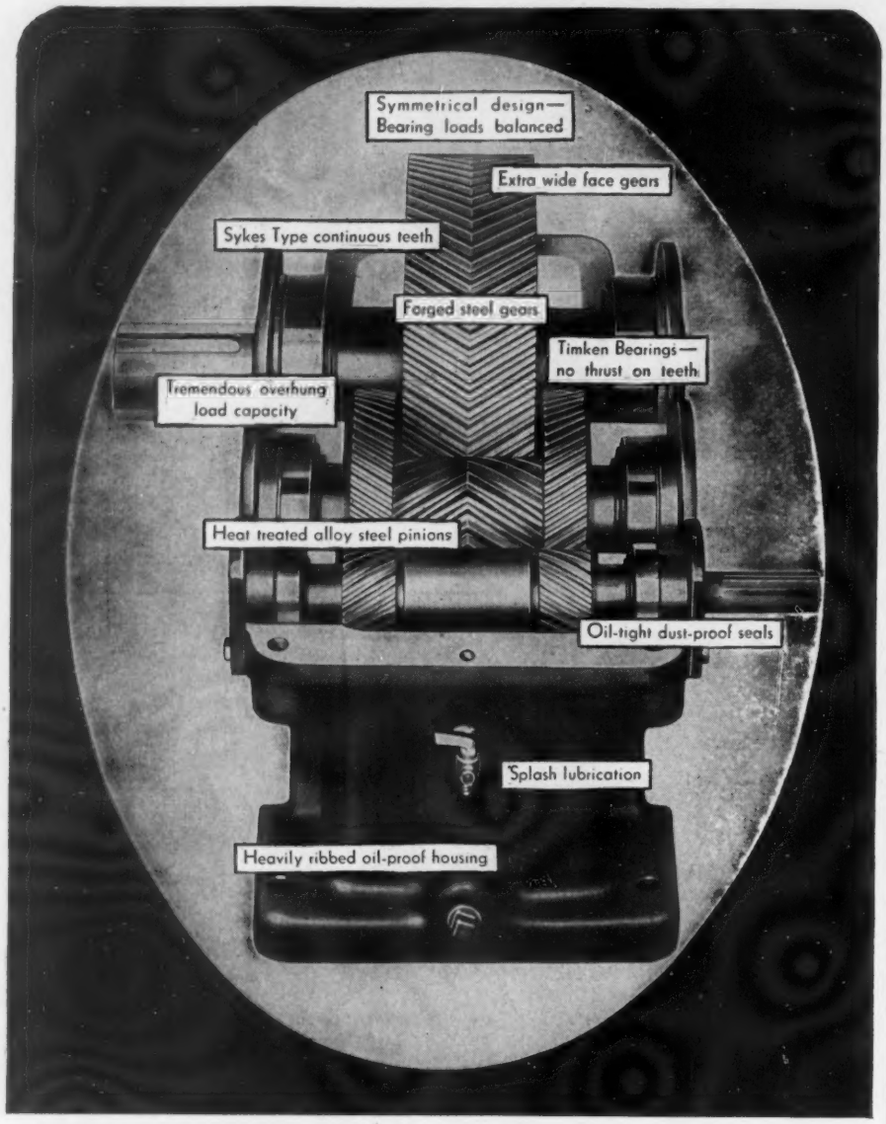

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Steel Bars . . .

Further revisions in bar extras may be made for remedying inequities

Bar Prices, Page 338

Philadelphia — The delivered price on hot carbon bars here is 2.98c, reflecting the 2 cent increase per 100 pounds in the freight rate from Pittsburgh, the governing basing point for this area on this material.

As most mills are booked up solidly for the first quarter and have not as yet opened their books for second quarter, new buying is limited. However, there is still heavy consumer pressure for all the tonnage that can be had, especially in the smaller size carbon bars, 1½ inches and under; this applies to both hot and cold drawn carbon steel.

New York — Carbon bar producers are booked up tightly for the current quarter and as they have not opened their books for the succeeding three-month period, they are to all practical intents and purposes out of the market. The situation in alloy bars is tightening, with one producer having little to offer before late February; however, six weeks seems to be about the average delivery promise on both hot and cold-drawn alloys. Cold-drawn carbon bar sellers are practically out of the market for the quarter regardless of size of bar involved.

Delivered price on hot-rolled bars is now 3.01c, reflecting the new 41-cent freight from Buffalo, the governing basing point for this area on hot-rolled bars.

Chicago — Consumers of steel bars still are enmeshed in the new schedule of extras which so far has proved more complicated than former schedules. Finding that they now must pay extra for some things heretofore regarded as standard, they are making studies of those treatments and handlings which can be dispensed with to reduce or eliminate extras. Among the extras they would seek to avoid are those for shrouding, lifts under five tons and dead lengths. Mills report numerous inquiries into these matters. It seems likely, therefore, that the new extras, designed to place costs where they belong, may be far-reaching in changing customer buying habits. Warehouses are specifying to avoid extras and forgers are expecting their customers to do the same. Forgers appear to have good and workable bar inventories, and currently are finding automotive interests exerting greater pressure for deliveries. One Chicago barmaker is planning that by addition of eight turns to its small bar mills it will have available for sale about 12,000 tons more production in first qurater.

Boston — Although clarifying, application of carbon bar extras still confuses. This involves higher prices within the range from merchant-commercial grades to killed quality steel, notably in the lower carbons. Confusion is noted among buyers for many grades required for carburizing, machining, forging and special processing. Buyers find they are paying substantially higher prices, $13 and more a ton, the base price advance being nominal. Extras ranging from 15 to 40 cents per 100 pounds with intermediate grades included, takes into account rimmed, capped, semi-killed and killed steel, involving differences in mill practice. Net result

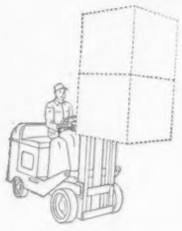
is maneuvering to avoid or reduce quality and other extras. Warehouses, distributing a substantial portion of this type of bar tonnage, are caught in this dilemma without pricing policy provisions to cover these advances. There are numerous borderline factors as between grades with cost factors and satisfactory metallurgical factors involved in potential specification changes. With carryovers heavy, first quarter schedules for small-sizes are filled with substantial tonnage backed up for second quarter assignment in both hot and cold-drawn carbon stock. Wyckoff Steel Co., New England Works, Putnam, Conn. has issued a surplus stock list, 443 tons, mostly rounds over one inch to two and one-half inch, bulk being B-1112 and B-1113 in random lengths.

St. Louis — Production of merchant bars declined last week because of repairs but full operations were resumed immediately after the holiday. Demand is insistent, with numerous reports of fantastic prices being offered for export orders. Shipments for export here, however, do not run over 5 or 6 per cent of total tonnage. Drawers are worried over declining scrap piles and scarcity of old rails is endangering concrete bar output. Pig allocations occasionally fail to arrive and are not made up in later shipments. Majority of barmakers in this district boosted prices last week. Merchant bars went up an extra $10 to $62 per ton at Chicago.

Seattle — While steel bar prices have risen, local mills have not yet adjusted their sights to the higher levels. While increases are certain the new price lists have not yet been compiled. Mills are trying to reduce backlogs and are not committing themselves into the future.

Pittsburgh — Some interests believe further revisions to the new bar extras may be established, aimed at clarification and remedying specific inequities that may now be present. There is considerable confusion as to when the "killed" steel or various chemical requirement extras are applicable. Some large consumers believe the industry has gone "too far" in both the carbon and alloy extra card revisions, and in their opinion some extras will not long be retained in present form.

Cold-finished alloy bar extra card closely follows the new pattern established for hot-rolled alloys in respect to size, quantity and quality extras. The size extras for cold-finished alloy rounds, squares and hexagons have been broken down into a new series of size ranges, with the largest advances in extras applicable for smaller size classifications. The width range in the size extra card for cold-finished alloy flats now includes a column for over 3 to 6 inches, inclusive, and over 6 inches. Quantity extras have been revised, with 40,000 pounds and over being the new base. Most of the quantity extras have been increased, although one remains unchanged and another reduced. Specific extras are established for magnetic testing, dependent on size range; previously there was a flat charge of 10 cents per 100 pounds. Aircraft and rifle barrel quality extras have been increased 10 cents. New extra schedule is now applicable for bundling, and an extra of 15 cents per 100 pounds is charged for wrapping coils. Sharp increases also are noted in extras for chamfering, accuracy, and for cold drawn ground and polished.



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Tubular Goods . . .

Leading sellers advance prices on wide range of pipe and tubing

Tubular Goods Prices, Page 339

Pittsburgh — National Tube Co. increased oil country tubular goods $6.50 per ton, seamless standard and line pipe $7.30, and butt welded pipe $9, effective Dec. 28. New discount list, compared with old, follows:

Butt Welded Steel Pipe

Inches	Black New	Black Old	Galvanized New	Galvanized Old
⅛	48	53	23	30
¼ & ⅜	51	56	30½	37½
½	55½	60½	41	48
¾	58½	63½	45	52
1 to 3	60½	65½	47½	54½

The company also has increased prices for minimum wall boiler tubes. New price for cold drawn 2-in. O.D., 13 Birmingham width gage, is $18.17 per 100 feet, fob Pittsburgh, in carload lots; hot-rolled $15.29. This compares with $16.52 and $13.90, respectively. New prices for other sizes are listed below.

Seamless Boiler Tubes

O.D. Sizes	B.W.G.	Hot-Rolled New	Hot-Rolled Old	Cold Drawn New	Cold Drawn Old
2½	12	$20.57	$18.70	$24.43	$22.21
3	12	24.87	20.79	27.18	24.71
3½	11	28.88	26.24	34.30	31.18
4	10	35.72	32.56	42.55	38.68

National Tube Co. has raised seamless, black, standard line pipe under 8-in. O.D., plain end, $8; treaded and coupled, $10. For 8⅝-in. to 13⅜-in. O.D., the advance is $6 and $8, respectively. Seamless galvanized standard line pipe, under 8-in. O.D., plain end, the advance is $12; threaded and coupled, $14. For 8⅝ to 13⅜-in., the increase is $10 and $12, respectively. Seamless black line pipe, 4-in. O.D. and larger is up $5 for ⅜ to ⅝-in. wall thickness; 5/16-in. wall, $5; 9/32-in. wall, $6; and ¼-in. wall, $7.

Seamless oil country casing advanced as follows: H-40, $9; J-55 and N-80, $5. Seamless oil country tubing advanced $10 for H-40; $6, J-55; and $12, N-80. Seamless upset casing advanced $6. No increase was announced for drill pipe, Grade D (API) but for special joint the price is advanced $10 for both grades.

No allowance was made for jobbers' commission or cash discount.

Babcock & Wilcox Tube Co., Beaver Falls, Pa., raised seamless and welded, hot and cold-finished carbon steel pressure tubing 10 per cent, effective on shipments Dec. 31. The company also advanced prices for hot and cold-finished carbon steel seamless mechanical tubing prices 7½ per cent.

Steel & Tubes Division of Republic Steel Corp. has established new prices on straight and fabricated mechanical tubing; propeller shaft tubing also was increased. The new prices reflect actual increase in strip steel costs, plus usual percentage for conversion scrap. Price advances are not uniform in all sizes and gages and, therefore, no flat percentage of increase can be applied.

Manufacturers Light & Heat Co., Harrisburg, Pa., is planning a two-year expansion program of its gas distribution facilities in Pittsburgh area at cost of $7 million. Program includes enlargement of existing transmission lines, in-

stallation of new high pressure transmission lines, and development of underground storage facilities in Western Pennsylvania and parts of West Virginia and Ohio. The company recently completed a new 54-mile pipe line into Pittsburgh and is planning a 22-mile line in 1947 to a point near Ellwood City, Pa.

St. Louis — Most mills in this district raised pipe prices last week, standard threaded and coupled black pipe going up $10 to a new base of $81 at Chicago and galvanized up $14 to $107 at Chicago.

Seattle — Demand for cast iron pipe is strong but deliveries are a retarding influence, recent awards having been based on 1948 delivery. The potential market in this area indicates a large volume as soon as mills can reduce their backlogs. Alderwood Manor, Wash., has opened bids for a large tonnage of steel pipe, alternate bids for wood. Seattle opened bids Jan. 2 for 150 tons of 8 in. C. I. water pipe. Washington state plans fish rearing facilities at Bowman's Lake involving unstated tonnage of 1 to 12 in. iron and steel pipe.

Wire . . .

Producers advance bright, basic, bessemer and spring prices $5 a ton

Wire Prices, Page 339

Boston — Low carbon drawn wire prices have been advanced by a leading producer $5 a ton while a new card of extras increases some grades and sizes substantially higher. Premier spring wire also has been advanced a like amount.

Until drawn wire extras are better digested, many consumers are in doubt as to steel cost increases this quarter. As in other steel products, base price advances are nominal, the impact coming through extras, notably in some low carbon grades. Although not yet fully realized, users of some grades of wire find material costs hiked substantially, $15 a ton in some cases. With most consumers short of stock, no serious resistance to higher prices has developed beyond minor moves to dodge this or that extra, a trend expected to become more apparent. An early improvement in supply is doubtful, although by shaking loose old delinquent tonnage from backlogs, mills with rods available are likely to hold closer to first quarter shipping schedules on firm tonnage. Improved margins on some low priced items may make for slightly better production in these, but limited rod supply and geographical factors will be retarding factors, notably with nonintegrated producers.

St. Louis — Most mills in this district raised wire prices last week. Base price was increased $5 on all kinds of wire, except specialties and rope wire. Manufacturers wire is $3.30 per 100 lb at Chicago and high carbon spring wire is $4.25 plus extras. Medium basic wire went to $4.60.

Cleveland — In addition to advances announced in wire prices, leading sellers also advanced wire products to the trade as follows: Woven fence, $12; barbed wire and barbles wire, $15; bale ties $13.50 a ton, and fence posts, $10 a ton.

Chicago — Of all wire items, nails

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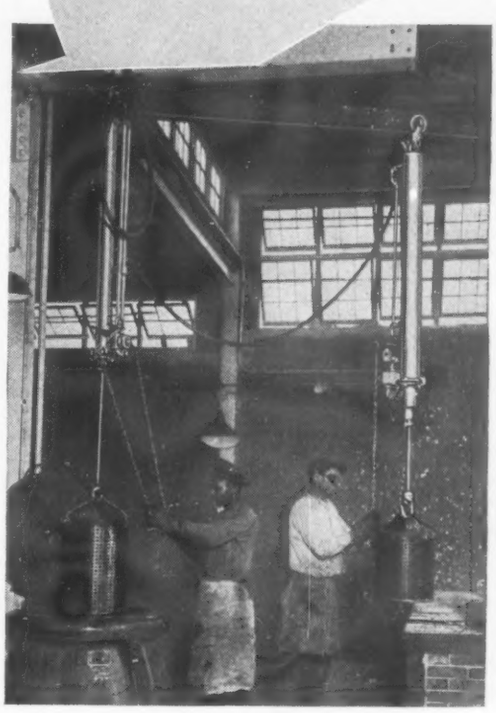

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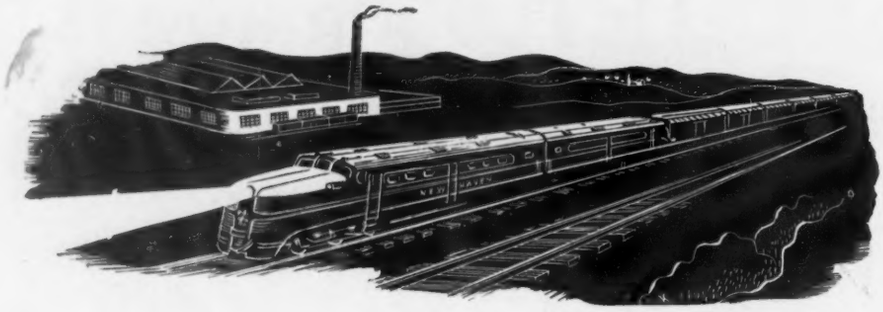

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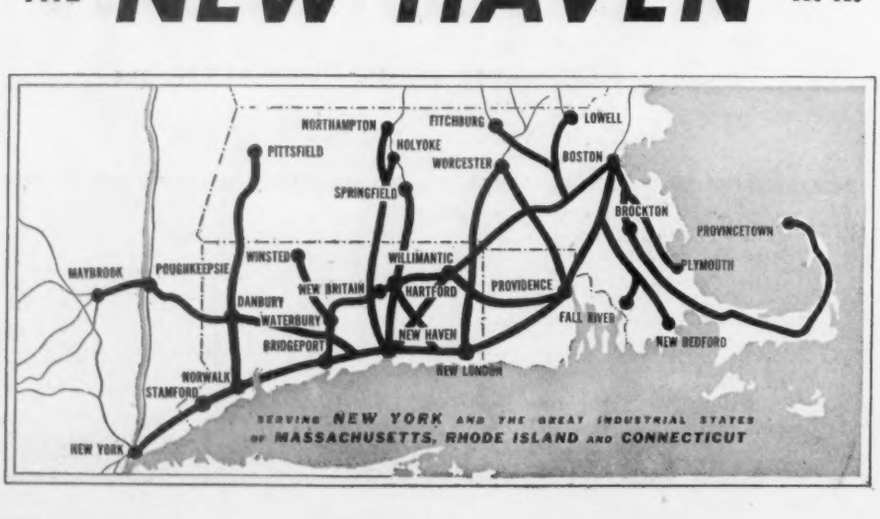

continue the most critical, with tacks for the upholstery trade a very close second. For these as well as other merchant and manufacturers' items, demand exceeds ability to produce by a substantial margin. Higher prices have served as no deterrent to demand, under shortage conditions, the matter of availability of material holds top importance.

Structural Shapes . . .

Structural Shape Prices, Page 339

Philadelphia — As a result of the recent freight advance, the shape market here is now 2.49c, delivered, as against 2.48c previously. This reflects an advance of 1 cent per hundred pounds in the rate from Bethlehem, Pa., the governing base point for this district.

While structural awards are still light, the outlook is more lively, as restrictions on non-housing construction are being gradually lifted. Significant in this regard are the projects approved by the local office of Civilian Production Administration during the latest period to be reported, Dec. 13-19, inclusive. Thirty-six projects were approved, having a total valuation of $1,685,244, against 17 denied and having a total valuation of $253,446. Outstanding among the projects approved is a $915,982 engine terminal for the Pennsylvania Railroad, south of Mackley Street, Harrisburg, Pa. Another sizable project involves a $193,500 building for the Container Corp. of America, Nixon and Fountain streets, Philadelphia.

Pittsburgh — Scarcity of structural shapes forced endless delay in many construction programs last year and little improvement in the supply outlook is indicated for the near future. A number of expansion programs also are being held due to extended mill deliveries and uncertain price and wage structure outlook. However, the indicated advance in structural price base and applicable extras soon is expected to be announced by Carnegie-Illinois Steel Corp.

Pennsylvania state road construction program budget this year involves over $3 million. Bulk of proposed construction work recently approved by CPA involves miscellaneous repairs. Most structural mills are booked well through the first half, although some headway currently is being made against order backlogs.

Chicago — Activity in structural steel drifts along in the doldrums, awards as well as new inquiry being few and scattered. In the majority of cases, awards which are made are jobs which have been hanging for some weeks. Running behind in shop schedules and unable to get full quotas of plain shapes from mills, fabricators display little interest in booking new contracts. What open capacity they have undoubtedly will fill up as long-time customers come to them for accommodation. Despite the quiet situation at the moment, there is no lack of optimism for the future, for it is known that much construction is contemplated for 1947. Only availability of steel and perhaps manpower will be the limiting factors to volume.

Seattle — Lack of steel is forcing fabricating shops to decline many sizable orders, their first objective being to make delivery of current orders. Materials, delayed by the maritime strike, are now arriving by water augmented by more recent orders being shipped overland. However supplies are far below requirements

and little improvement is anticipated during the first quarter.

Shapes pending include a $128,000 40 x 80-foot exchange building addition for Pacific Telephone & Telegraph Co., Portland, authority for which has been granted. Bureau of Reclamation, Denver, has called bids Jan. 22 for 132 trash racks for Coulee dam spec. 1614, and Jan. 23 for materials for a steel bridge at Cascade dam, Idaho, spec. 1615.

Boston — Contracts for fabricated structural steel let here surpass by large margins tonnage for New England; this will continue through 1947 with Stone & Webster Engineering Corp., E. B. Badger & Sons, F. H. McGraw & Co. among others negotiating large tonnages for power plants, oil refineries and engineering construction. Outstanding district project up is a 5500-ton high-level bridge, Connecticut river, Saybrook, Conn., closing Jan. 20, Hartford. For power plants, better than 25,000 tons are in prospect, including 1200 tons, Stamford, Conn. District fabricators start the year with fair, but somewhat lower small-lot backlogs, bulk estimated at warehouse price levels for plain material. Blaw-Knox Co., Pittsburgh, will erect a 600-foot self-supporting antenna tower, first Westinghouse television station, WBZ-TV, Boston.

New York — Total estimated structural bookings for November of 98,804 tons compared with the revised total of the preceding month of 141,516, according to the American Institute of Steel Construction. The total for the first 11 months was 1,624,812, an increase of 19 per cent over the average of 1,366,183 tons for the same period in the five pre-war years 1936-1940.

November shipments amounted to 144,488 tons against the revised figure of 152,321 tons in the preceding month. Total shipments for the first 11 months were 1,384,341, against an average of 1,342,962 for the corresponding period in the five pre-war years. Tonnage available for fabrication within the four months beginning Dec. 1 was 655,362 tons, against an average of 350,268 tons for the years 1936-1940 inclusive.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 339

Chicago — Writing off 1946 as an unsatisfactory year due to short steel supply and rapidly rising construction costs, reinforcing steel suppliers are looking forward to the new year with optimism. Whether hope can be fulfilled depends upon whether steel production is free from serious interruption. Supplies of other building materials are expected to improve and costs to level off. During the latter part of 1946, many jobs brought out for bid were deferred because costs would exceed estimates. Some projects failed to attract bids because bar interests lacked steel and were already over-committed.

St. Louis — Demand for reinforcing bars continues heavy. Fabricated items have advanced $7 a ton to $59 plus extras while mill lengths have risen a like amount to $49. Most of the latter rise was accomplished by eliminating a former $5 functional discount.

Seattle—Demand for reinforcing bars continues steady and is of major volume. Not many large orders have been taken, however, for the first quarter. New busi-

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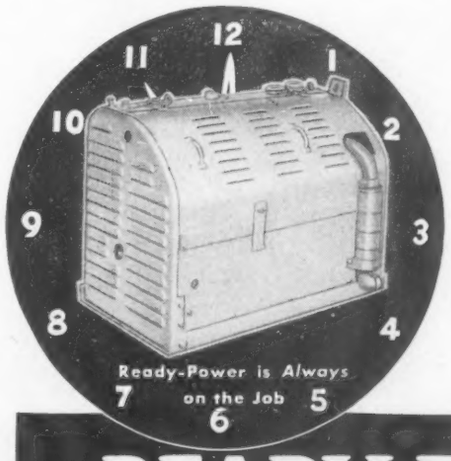

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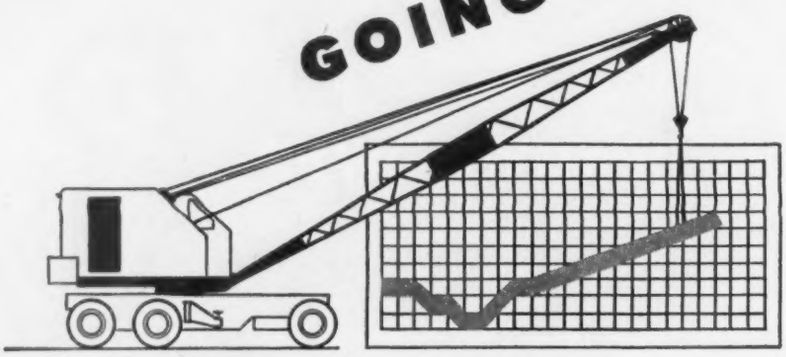

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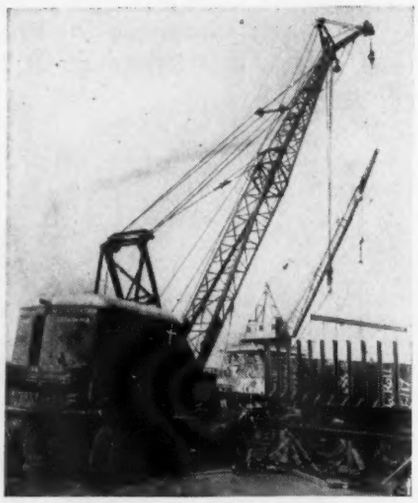

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ness is mostly in small lots for regular customers or emergency projects. Northwest Steel Rolling Mills Inc. has closed for two weeks to undertake its annual overhaul.

West Coast Steel Sellers Revise Prices Upward

San Francisco—Columbia Steel Corp., subsidiary of U. S. Steel Corp., has announced a $2 a ton increase in the price of carbon bars and small steel shapes. The new price, delivered at West Coast points, is $66.20 a net ton.

Columbia's action followed by a few days that taken by Kaiser Co. which raised prices $7 a ton on plates, carbon bars and small shapes and structural shapes. However, Columbia's new price is considerably below Kaiser's on comparable products, and Geneva also is underselling Kaiser on plates. Kaiser now is pricing plate at $69.20 a net ton compared with $62.20 for Geneva plates. Kaiser's price of $71.20 on carbon bars and small shapes is $5 a ton above Columbia's. The new Kaiser price for structural shapes is $68.20. Geneva has made no change in its prices on structural shapes.

Tin Plate . . .

Tin Plate Prices, Page 339

Pittsburgh — Domestic tin plate requirements in 1947 are expected to tax production facilities to the limit despite a substantial increase in industry's capacity scheduled for this year. Indicated 1947 demand is 4.3 million tons, against estimated output of 3.8 million. Increased demand for electrolytic tin plate is expected to result from the dropping of the regulations governing use of tin containers for packaging food and non-food products.

Tin plate output was not so hard hit as other steel products during the two coal strikes last year. However, due to the steel strike and other work stoppages, the industry enters 1947 with a fairly large carryover tonnage. The Maritime strike has resulted in 75,000 tons of carryover export tonnage, which must be made up this quarter, bringing the export load for this period to 130,000 tons. Total export requirements for 1947 are estimated at 400,000 tons.

Pig Iron . . .

Pig Iron Prices, Page 341

Pittsburgh—Withdrawal of major steel producers from the scrap market has forced them to increase proportion of pig iron in open-hearth operation. One integrated mill claims to be able to remain out of the market for nearly a month as result of recent accumulation of pig iron from an outside source. Decision of Office of Temporary Controls to cancel December rated tonnage carryovers was of little consequence to lone merchant pig iron producer here for this interest had relatively little of this tonnage on its books. Most foundries enter the new year with exceptionally large order backlogs, and in most instances little headway has been made in recent weeks against these accumulated orders due to restricted pig iron supply which is exepected to remain tight through most of this year. Casting prices soon are expected to be

adjusted upward, reflecting price increase in pig iron and higher freight rates. One large interest in Birmingham district recently advanced prices another $2 per ton to $28.88 for No. 2 foundry.

New York—With an increase of 50 cents a ton in the freight rate from Bethlehem, the lowest delivered price in Brooklyn is now $34.50 on No. 2 foundry iron and $35 on malleable. Newark, N. J., delivered price is $33.34 on No. 2; $32.84 on basic; $34.34 on bessemer and $35.54 on malleable.

Boston—In foundry grades pig iron supply is improving as more "free" tonnage moves to hard-pressed consumers from Everett. Approximately half of the 4000 tons of certified orders for December shipment went into carryover and was canceled; part of this tonnage in new certified orders is included in January ratings which total near 4000 tons. Mystic furnace will cover practically all new England certified volume this month. Considering the delay in resumption of blast, more iron than expected has gone to non-rated melters, although generally spread thin thus far. Improvement in supply of basic is less evident; less iron is coming in from Buffalo, while the Troy furnace is on low phos. Deliveries from New York furnaces will be restricted this month. New freight rate from Buffalo is $6.48 to Boston; Bethlehem, Birdsboro and Swedeland, Pa., $4.82, and Troy, N. Y., $3.83.

Seattle—Pig iron is extremely hard to get but dealers hope the situation will be eased within a month. All buying is on allocation from Washington and shipments scheduled for November delivery have not yet arrived. Demand continues strong and is augmented by the scarcity of cast iron scrap. Prevailing price is $30.50, fob car Geneva.

Scrap . . .

Scrap Prices Page 342

Pittsburgh — Leading scrap consumers have withdrawn from the market in an attempt to stabilize prices. Carnegie-Illinois Steel Corp. is out of the market here and at Chicago; while Pittsburgh Steel Co., Crucible Steel Co. of America, Allegheny Ludlum Steel Corp., and Jones & Laughlin Steel Corp. also have withdrawn, indicating strong resistance to a further upsurge in prices. Railroads too are attempting to restrain upward price trend for their lists.

With steelmaking scrap selling at $2.50 per gross ton higher than basic pig iron, charging of hot metal and cold pig iron is being increased, and this trend undoubtedly has been accentuated with mills temporarily out of the market. Pittsburgh Steel Co. has been able to accumulate some pig iron from an outside source which will enable the company to extend its present scrap inventories over a month without curtailing open hearth operations.

Opinion differs as to whether present scrap price level represents ceiling of recent upward movement. There are strong indications of a leveling off in prices, based on fact scrap is out of line pricewise with pig iron, and the apparent concerted effort of mills and foundries to resist higher prices. The advance in scrap prices has brought out considerable tonnage held in speculation of higher prices, but has not resulted in collection of significant tonnage from remote areas. However, collection efforts are expected

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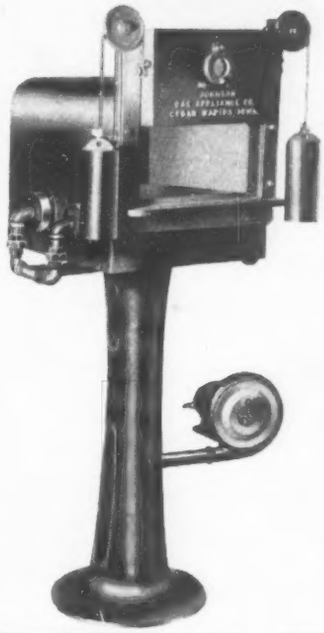


The* ALL AROUND *Furnaces for heat treating tools, dies, and small metal parts

You can heat treat ANY steels, punches, dies and cutting tools right in your own plant and save time and money. Turn on the heat and you're ready for action with *Quick Acting* Johnson Hi-Speed Furnaces. No wasted time waiting for warming up. These versatile units reach high, uniform temperatures FAST with remarkably low fuel consumption. Pay for themselves in efficiency and operating economy. Temperatures easily regulated with accuracy. Write today for complete literature describing all *Quick Acting* Johnson Hi-Speed Furnaces. There's a size for every tool room.

JOHNSON GAS APPLIANCE CO.
573 E Avenue N.W. Cedar Rapids, Iowa

JOHNSON HI-SPEED No. 130A
4-Burner: 1400 - 2350° F.
Firebox 7¾ x 13 x 16½
$295.00 *F.O.B. Factory*
(6-Burner: 1800 - 2400° F. **$325.00**)

JOHNSON HI-SPEED No. 120
1500° F. in 5 Minutes
2300° F. in 30 Minutes
Firebox 5 x 7¾ x 13½
$145.50 *F.O.B. Factory*

JOHNSON HI-SPEED No. 70
2250° F. in 30 Minutes from a Cold Start
Firebox 5 x 7¾ x 9
$105.50 *F.O.B. Factory*

All furnaces shown are equipped complete with Carbofrax Hearth, G. E. Motor and Johnson Blower.

TURN THE HEAT ON PRODUCTION with *Quick Acting* JOHNSON Furnaces

JOHNSON GAS APPLIANCE CO.
573 E Avenue N. W., Cedar Rapids, Iowa
Please send Complete Johnson Catalog.

Name_____
Address_____
City_____ Zone_____
State_____

Latest JOHNSON Catalog gives detailed information on all time-saving, cost-saving JOHNSON Furnaces. Industrial gas burners for every purpose.

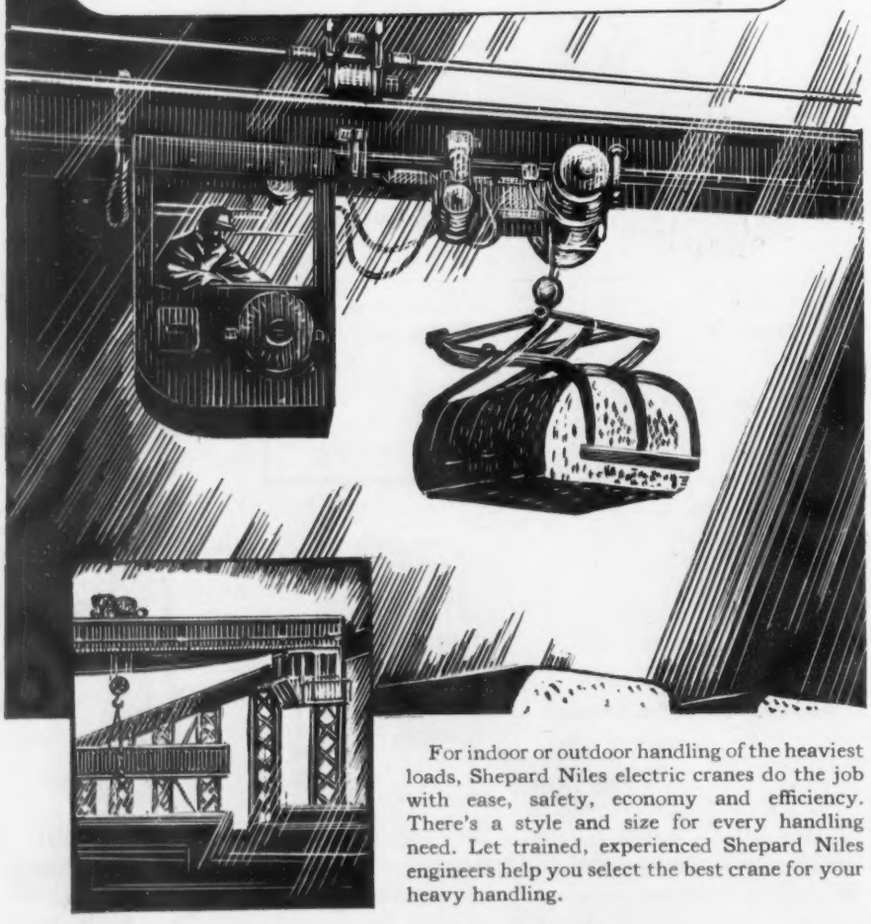
WRITE FOR COMPLETE JOHNSON CATALOG

Need A Railroad In Your Plant?

When you install a Shepard Niles monorail hoist you have your own private railroad to lift heavy loads, move them to other parts of the plant and deposit them where needed.

America's oldest builder of electric hoists and cranes has a style and size of monorail hoist for every handling operation from 1/8 to 20 tons. Trained, experienced Shepard Niles engineers will gladly survey your material handling problems and recommend, without obligation, the best style of monorail hoist to do the job. With over 5,000 styles and sizes from which to choose, there's bound to be one to suit you.

Shepard Niles monorail hoists, whether floor or cab operated, work economically and efficiently, year after year. When a Shepard Niles does the work there's no tired muscles, no absenteeism.



For indoor or outdoor handling of the heaviest loads, Shepard Niles electric cranes do the job with ease, safety, economy and efficiency. There's a style and size for every handling need. Let trained, experienced Shepard Niles engineers help you select the best crane for your heavy handling.

Shepard Niles
CRANE & HOIST CORPORATION
358 SCHUYLER AVE., MONTOUR FALLS, N. Y.

to be stepped up substantially under more favorable weather conditions this spring.

Philadelphia—Delivered prices on the principal melting steel grades of scrap are holding fairly steady at $30.50 to $31.50. No. 3 bundles, however, are up more than $1, now holding at $28.50 to $29, and substantial increases have been made in machine shop turnings, mixed borings and turnings, short shovel turnings and cast iron borings, which are now at $23.50 to $24.00. No. 1 chemical borings are now being sold at $31 to $31.50, delivered, and No. 1 cupola cast at $41 to $42.00. Charging box and heavy breakable cast grades and also malleable are moving at $40, clean auto cast at $41 to $42, No. 1 wheels at $41 and burnt cast at $38.

Scrap generally continues to move more freely, although there are no signs of weakness in any grade, as demand remains active.

New York—Scrap brokers' buying prices on most of the principal grades show little change. In fact, the only recent revision is in unstripped motor blocks, which are up 50 cents a ton to $34.50. The melting grades continue at $25.50 and the two leading cast grades remain at $37 to $38. Demand is still active, although supply is somewhat improved as a result of the further increases in prices, which have been in effect recently.

Chicago—Open-hearth scrap prices held steady last week at $30, mills maintaining their firm position of not paying over that figure. While higher prices continue to be heard, investigation reveals these represent transactions for remote material and involve small tonnages. The $30 price for home scrap is producing a fair flow but with demand strong buyers and sellers are moving cautiously and short term contracts are the general rule. Prices of secondary grades are still in confusion under light trading and prices have not yet stabilized. With supply far short of demand cast grades continue in a broad price bracket.

Warehouse . . .

Warehouse Prices, Page 340

Boston—In following mill advances on most products, warehouses are revising price structures accordingly with application of new extras. Heretofore, in numerous instances, pricing policies of distributors made no provision for new changes involving details. With inventories unbalanced, most lighter carbon steel products are in short supply. Warehouse sellers have been unable to cover extensively for first quarter in items most in demand, including flat rolled items, small bars, light plates and structurals. Stocks of alloy steel products, including stainless and cold-drawn carbon bars in large sizes, are ample.

Philadelphia—Warehouse steel prices are unsettled, as a result of various changes in mill prices recently and advances in freight rates. New price schedules are being issued, and should become general soon.

Chicago—Imposition of new extras on steel products, principally sheets, strip and bars, giving a realistic distribution of costs, is likely to have significant effect upon buying habits. Already there is evidence that some warehouses pro-

pose to drop some items and to substitute others to avoid extras. General run of warehouse customers are expected to take the same approach. Demand for steel continues to hold up well and exceeds available supply except for alloys. Mills have resumed shipments in good volume, but there can be no retrieving of the loss sustained from the coal strike.

Seattle — Jobbing houses are compiling new price schedules adjusted to base raises, and higher extras, the higher levels already in effect here. The average increase is about 10 per cent. The same prices will be adopted by Portland and Tacoma houses. Delayed materials are now arriving by water but one steamship line is still idle due to a dispute with union radio operators. The usual seasonal drop in demand is not apparent this year, all items moving freely. One leading warehouse reports December volume higher than November. Of several critical items, galvanized sheets are the most critical, shops having no inventories and earliest delivery of this item being about nine months.

Iron Ore . . .

Iron Ore Prices, Page 340

Cleveland—Consumption of Lake Superior iron ore declined in November to 5,611,627 gross tons from 6,625,145 tons in October, according to the Lake Superior Iron Ore Association, this city. This brought the total for the first 11 months to 56,576,573 tons compared with 68,476,744 tons in the like 1945 period. Of the November total 170,076 tons were consumed in Canada.

Total stocks as of Dec. 1 totaled 41,918,189 tons compared with 40,435,384 tons a month earlier and 44,706,399 tons on the same date in 1945. Of the Dec. 1 total, 4,856,537 tons were on Lake Erie docks in this country and 37,062,652 tons at furnaces, including 1,451,822 in Canada and 35,610,830 in the United States.

As of Dec. 1, 126 blast furnaces, depending principally on Lake Superior ore, were in blast compared with 170 a month earlier and 154 on the same date in 1945. The number in blast in this country on Dec. 1 was 119, 66 being idle.

Semifinished Steel . . .

Semifinished Prices, Page 338

Pittsburgh — Most producers have established a single price base on wire rods of $2.55 per 100 pounds (Pittsburgh Steel at $2.80) for ¼-in. to 7/32-in., with new schedule of extras applying over ¼-in. as follows: 17/64 to 3/8-in. inclusive, 15 cents per 100 pounds; 25/64 and 13/32-in., 50 cents; 27/64 to 15/32-in. 40; 31/64-in, 30; 9/16 to 19/32-in., 25; and 39/64 to 23/32-in., 20 cents. Coils produced by welding one or more standard coils together now will be furnished only at an extra of 15 cents for rods 7/32 to ⅜-in. inclusive, and 25 cents for larger than 3/8 to 47/64-in.

Quantity extras for carload and less carload shipments formerly were based on 5 gross tons; now on 10 net tons. Extras for chemical composition generally are unchanged, although the maximum of the range is now used in determining the extra. Up to 0.20 per cent copper minimum, no maximum specified, the ex-

PAGE Stainless Steel WIRE

● It isn't boasting to say that we really know something about stainless steel wire. Wire has always been the business of PAGE. And stainless steel wire has been a PAGE specialty almost since the introduction of stainless.

PAGE offers you a responsible source for wire and information about its use in production. High and low carbon steel, Armco iron as well as various analyses of stainless. Get in touch with PAGE.

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Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

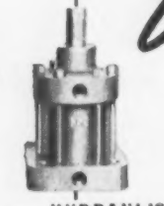
SPECIFY

T-J

for Tough Jobs!

T-J Performance is helping plants throughout industry handle tough jobs at *top-speed* and *efficiency* . . . with *lower costs!*

Right now in your plant—there may be many jobs that T-J Products can perform faster and better. Check your needs for air cylinders . . . hydraulic cylinders . . . Rivitors . . . cutters . . . Clinchors . . . or air controls — these are products that T-J builds with ahead-of-the-times features! Backed by more than a quarter of a century's experience . . . T-J engineered and precision-built for utmost *accuracy* and *dependability.* Write for bulletins. The Tomkins-Johnson Co., Jackson, Mich.


T-J HYDRAULIC CYLINDERS

T-J AIR CYLINDERS

T-J CLINCHORS

T-J CUTTERS

T-J AIR CONTROLS

T-J RIVITORS

TOMKINS-JOHNSON
RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS
T-J

tra is now 15 cents, against 10 cents previously.

Restrictive carbon analysis extra is 5 cents for each 0.01 per cent or fraction of restriction under standard chemical range, compared with 2.5 cents formerly. There is now an extra of 50 cents for cold heating quality.

Previously there was an overall extra of 50 cents for special requirement quality, now 50 cents for each one of nine specific tests listed in the new schedule are applied individually. There is an extra of 40 cents for low carbon wire rods required for direct drawing from rods to wire sizes smaller than 16 gage without intermediate annealing.

Extras for finish and treatment, such as annealed or cleaned and oiled have been increased 10 and 15 cents to 40 and 35 cents, respectively. Special carloading extras of 5 cents per 100 pounds for box car loading and 10 cents for gondola cars are charged.

Straightening and cutting extras have been completely revised and are now 80 cents for lengths of 2 feet and longer, sizes 5/16-in. and smaller.

Crucible Steel Co. Revises Stainless Steel Price Lists

New York—Crucible Steel Co. of America has simplified price structure on its stainless steel products. The new price lists, covering base prices and extras, eliminate the complex calculations previously made necessary by application of the 8.2 per cent increase. The revised prices, the company said, will approximate previous prices and were effective on shipments made on and after Jan. 1. The new base prices in cents per pound are as follows:

Grade	Bars Drawn Wire Structurals	Plates	Sheets	Hot Rolled Strip	Cold Rolled Strip
301 ...	26.00c	29.50c	37.00c	22.00c	28.00c
302 ...	26.00	29.50	37.00	23.50	30.50
302B .	26.00	29.50	37.00	23.50	30.50
303 ...	28.50	31.50	39.00	29.50	36.00
304 ...	27.50	31.50	39.00	25.50	32.50
308 ...	31.50	37.00	44.50	31.00	38.00
309 ...	39.00	43.50	51.00	40.50	51.00
310 ...	53.50	56.50	57.50	53.00	61.00
311 ...	53.50	56.50	57.50	53.00	61.00
316 ...	43.50	48.00	52.00	43.50	52.00
321 ...	31.50	37.00	44.50	32.00	41.50
325 ...	28.50	32.50	40.50	28.50	37.00
330 ...	53.50	56.50	57.50	53.00	61.00
347 ...	36.00	41.50	49.00	36.00	45.50
403 ...	23.50	27.00	32.00	23.00	29.50
405 ...	22.00	25.00	30.50	21.50	28.00
406 ...	25.00	28.50	34.00	25.00	34.00
410 ...	20.50	23.50	29.00	18.50	24.00
414 ...	20.50	23.50	29.00	18.50	24.00
416 ...	21.00	24.00	29.50	20.00	25.50
420 ...	26.00	31.00	36.50	26.00	39.50
430 ...	21.00	24.00	31.50	19.00	24.50
430F ..	21.50	24.50	32.00	20.50	27.00
431 ...	21.00	24.00	31.50	19.00	24.50
440A .	26.00	31.00	36.50	26.00	39.50
440B .	26.00	31.00	36.50	26.00	39.50
440C .	26.00	31.00	36.50	26.00	39.50
442 ...	24.50	28.00	35.50	26.00	35.00
443 ...	24.50	28.00	35.50	26.00	35.00
446 ...	30.00	33.00	39.50	38.00	56.50
*501 ..	9.00	13.00	17.50	13.00	18.50
*502 ..	10.00	14.50	18.50	14.50	19.50

* Low chromium.

Construction Firm Reports Largest Peacetime Backlog

The H. K. Ferguson Co., Cleveland, industrial engineers and builders, entered 1947 with the largest peacetime backlog of business in the firm's three decades.

Bethlehem Steel Sued For $200 Million Pay

Bethlehem Steel Co. has been sued for $200 million back "portal-to-portal" pay and damages by the United Steelworkers of America-CIO in the largest single suit filed by year's end. The suit covers 13,000 Bethlehem employees in 23 plants.

Structural Steel Demand Expected To Be Active

"Rental housing which in large cities means apartment house building on vast scale now has the green light from government. The structural steel industry is prepared to make 1947 the greatest construction year in its history," Thomas R. Mullen, president, American Institute of Steel Construction, says.

"For many months our industry has been pointing to the drastic need for large scale housing and we are gratified that the tenor of the times is for immediate and energetic production to fill the housing need.

"The demand for commercial and industrial buildings and for bridges combined with the housing demand will undoubtedly call for five million tons of structural steel in the next two years. Every effort to secure the material to fill this demand will be made by the structural steel industry, which has ample capacity to fabricate the steel. A recurrence of strikes, which interfered with production during six months of 1946, would have a crippling effect, however.

"Approximate total tonnage for 1946 was 1,772,522 tons of which 202,068 tons were for public structures including bridge engineering projects and buildings. Railroads used 60,266 tons of structural steel for bridges and buildings. Private sources used 1,231,902 tons and scattered small jobs under 50 tons each accounted for an additional 278,286 tons.

"Production in 1946 was drastically reduced by strikes and work stoppages. We are hopeful that 1947 will be a work-together year and if it is, tremendous progress can be made by the structural steel industry in doing its share toward closing the gap between demand and supply."

Continuous Employment Greatest Need—Grace

Industrial peace and continuous and efficient production are the greatest needs of the United States today, E. G. Grace, chairman, Bethlehem Steel Co., told employees in the company's bulletin last week. Mr. Grace outlined the steps Bethlehem is taking to assure employees steady work.

WIRE

HIGHEST QUALITY AND SERVICE GUARANTEED

•

Round + Flat + Square
Straightened and Cut
Shape Wire

•

HIGH CARBON SPRING
LOW CARBON BASIC & BESSEMER
OIL TEMPERED
WELDING WIRE RODS AND COILS

WIDE RANGE OF SIZES AND FINISHES

•

Wire for Practically All Purposes
and Requirements
Also SCREEN WIRE CLOTH

IRON STEEL WIRE "SENECA" QUALITY TRADE MARK

FLAT COLD ROLLED
STRIP STEEL
NARROW WIDTHS

The SENECA WIRE & MFG. CO.
FOSTORIA, OHIO
Representatives and Warehouses in practically all Principal Cities

Bethlehem currently "has a full capacity demand for its products," he stated; but to minimize future fluctuations in the production curve Bethlehem is doing the following:

Borrowing money to finance more production facilities.

Making a more diversified line of products.

Expanding sales and promotion facilities.

Carrying on commercial and technical research.

Warehousing tin plate for future delivery.

Producing rails on annual contract basis.

Manufacturing wire products throughout the year despite seasonal demands.

Stocking standard pipe to the degree storage space permits.

Stocking semifinished products, as well as standard steel products.

Doing plant maintenance jobs in off-season preiods.

Stock-piling of raw materials.

Maintaining warehouses or mill depots to supply regional distributors.

In respect to variations "beyond the control of industry" and due to changes in economic conditions Grace pointed to the federal social security program "to which Bethlehem has contributed $129 million . . . to protect the individual through unemployment insurance when he becomes unemployed for reasons beyond his control, and to assist him in his old age and in other problems. . . .

"There is but one solution to our problem, and that is industrial peace. Let all industry have full and uninterrupted production, and we will have steady employment at good wages, reasonable prices, a high standard of living, security and prosperity for all."

REDUCE LOST TIME due to REFRACTORY REPLACEMENT

The labor and materials used for refractory replacement are a terrific drag on production time. You can retrieve these wasted hours by eliminating the cause—and the best way is to USE GLOBE SUPERIOR LADLE BRICK. Wire cut or dry pressed, they will bring about CLEANER STEEL, LOWER PER TON BRICK COST, and SAVE TIME LOST IN REFRACTORY REPLACEMENT.

SERVING THE STEEL INDUSTRY SINCE 1873

The GLOBE Brick Co.

EAST LIVERPOOL, OHIO

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

3000 tons, plant building and boiler house, Bakelite Corp., Ottawa, Ill., to American Bridge Co., Pittsburgh; F. H. McGraw & Co., Hartford, Conn., contractor-engineer.

980 tons, telephone building, Indianapolis, for Indiana Bell Telephone Co., to American Bridge Co., Pittsburgh; Leslie Colvin, Indianapolis, contractor.

825 tons, power plant, Tampa Power & Light Co., Hookers Point, Fla., to Bristol Steel & Iron Co., Bristol, Va.; Stone & Webster Engineering Corp., Boston, contractor-engineer.

765 tons, 13 state bridges, Maine, steel delivered; 11 taking 610 tons to Phoenix Bridge Co., Phoenixville, Pa., $79,522.36; Presque Isle, Gouldville bridge, 100 tons, Fort Pitt Bridge Works, Pittsburgh, $16,842; Gardiner, New Mills bridge, 55 tons, American Bridge Co., Pittsburgh, $9,712.50; bids Dec. 18, state highway commission, Augusta.

550 tons, extension to Dresser power station, Terre Haute, Ind., for Public Service Co. of Indiana, to Bethlehem Steel Co., Bethlehem, Pa.; Sargent & Lundy, Chicago, engineers; bids Nov. 29.

310 tons, power house, Kankakee, Ill., for state hospital, to Rock Island Bridge & Iron Works, Rock Island, Ill.; John Moroff & Son, Kankakee, Ill., contractor; bids Sept. 12.

110 tons, plant addition, American Gelatin Co., Woburn, Mass., to O. A. Wilson Structural Co., Cambridge, Mass.

100 tons, crane runway, Chicago, for Cuneo Press Inc., to Wendnagel & Co., Chicago.

STRUCTURAL STEEL PENDING

3000 tons, fourth section to power plant, Venice, Ill., for Union Electric Power Co.; Stone & Webster Engineering Corp., Boston, engineer; bids in.

2640 tons, Clark Hill dam, Augusta, Ga., for U. S. Engineer; bids Jan. 3.

1200 tons, power plant, Connecticut Light & Power Co., Stamford, Conn.; Stone & Webster Engineering Corp., Boston, contractor-engineer.

140 tons, reconstruction Little Calumet river bridge, Harvey, Ill., for Illinois Central railroad; bids in.

100 tons, process tower, Chicago Heights, Ill., for Victor Chemical Co.

Unstated, 132 trash racks for Coulee Dam project, spec. 1614; bids to Bureau of Reclamation, Denver, Colo., Jan. 22.

Unstated, Cascade Dam bridge, Payette Division, Idaho; spec. 1615; bids to Bureau of Reclamation, Denver, Colo., Jan. 23.

Unstated, 40 x 80 ft steel frame telephone exchange addition, 822 SE Seventeenth Ave., Portland, Oreg.; approved by CPA; bids soon.

REINFORCING BARS . . .

REINFORCING BARS PLACED

310 tons, plant building and boiler house,

Bakelite Corp., Ottawa, Ill., to Concrete Steel Co., New York, and Joseph T. Ryerson & Son, Inc., Jersey City, N. J.; F. H. McGraw & Co., Hartford, Conn., contractor-engineer.

148 tons, power house, Kankakee, Ill., for state hospital, to Ceco Steel Products Corp., Chicago; John Moroff & Son, Kankakee, Ill., contractor; bids Sept. 12.

REINFORCING BARS PENDING

124 tons, jetties, Lincoln Park, Chicago, for Chicago Park district; bids Dec. 23.

Unstated, electrical engineering building, Urbana, Ill., for University of Illinois; bids Jan. 21.

Unstated, water filtration plant, Port Washington, Wis.; Joseph J. Duffy Co., Chicago, low on bids Oct. 30; bids over estimate, no award.

PLATES . . .

PLATES PLACED

325 tons, compressor unit, Whiting, Ind., for Standard Oil Co. (Indiana), to American Bridge Co., Pittsburgh; E. J. Albrecht Co., Chicago, contractor.

PLATES PENDING

Unstated, five storage tanks for Standard Oil Co., $50,000 project to Aberdeen, Wash.; construction permit granted.

PIPE . . .

CAST IRON PIPE PENDING

150 tons, 8-inch, for city of Seattle; bids Jan. 2.

Unstated, water system, Alderwood Manor, Wash.; alternate bids for wood; bids in.

Unstated, fish rearing project, Washington state; bids to Olympia soon; CPA approval granted.

RAILS, CARS . . .

LOCOMOTIVES PLACED

Chicago & Great Western, six 3-unit, 4500-horsepower diesel-electric freight locomotives, to the Electro-Motive Division, General Motors Corp., La Grange, Ill.

Consolidated Railways of Colombia, 15 mountain-type steam locomotives, to the H. K. Porter Co. Inc., Pittsburgh.

Southern Pacific, twenty-three, 1000-horsepower diesel electric locomotives, to American Locomotive Co., New York.

Union Pacific, 35 diesel-electric locomotives, comprising 28 freight and 7 passenger units, to American Locomotive Co., New York, and the Electro-Motive Division of General Motors Corp., La Grange, Ill. This brings the total diesel-electric locomotives to have been placed recently by the Union Pacific up to 64.

LOCOMOTIVES PENDING

Chesapeake & Ohio, 10 steam passenger locomotives, bids to be asked shortly.

RAILROAD CARS PLACED

Ontario & Northland, 750 double sheathed box cars, to National Steel Car Corp., Hamilton, Ont.

RAILROAD CARS PENDING

Chesapeake & Ohio Railway and Nickel Plate road, joint inquiry, 2600 all-steel freight cars, including 1000 70-ton hopper cars equipped with roller bearings and 1000 50-ton box cars for the C. & O., and 600 50-ton box cars for the Nickel Plate.

Chesapeake & Ohio, 2600 freight cars, including 1600 fifty-ton box and 1000 seventy-ton hopper cars.

Nickel Plate, Chesapeake & Ohio affiliate, 600 fifty-ton box cars.

Southern Pacific, 3000 fifty-ton box cars, bids asked.

CONSTRUCTION AND ENTERPRISE

CALIFORNIA

FRESNO, CALIF.—Federal Pipe & Supply Co., Arch B. Campbell, Fresno manager, has plans for construction of a steel warehouse, to cost approximately $40,000.

INGLEWOOD, CALIF.—De Luxe Furnace & Wall Heater Co., 4812 South Western Ave., Los Angeles, has received CPA approval for construction of a factory building, Regent and Oak Sts., to cost $35,735.

LOS ANGELES—Union Tool Co. has been incorporated with 7500 shares of no par value stock, by Lawrence M. Cahill, 606 South Hill St.

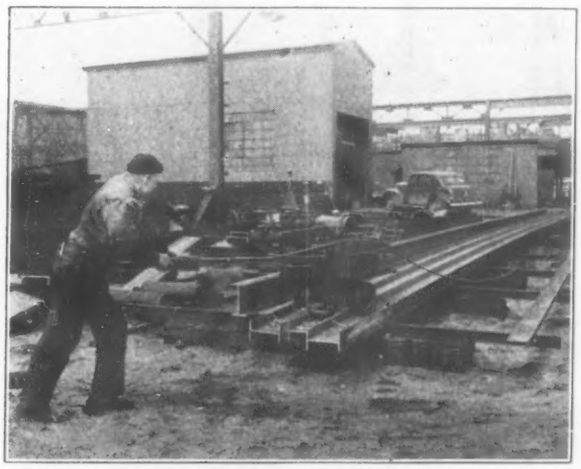
LOS ANGELES—United Metals Corp. has been formed with 500 shares of no par value capital stock, by Paul Westerlund, Security Bldg., Long Beach, Calif.

LOS ANGELES—Model Tool Corp. has been formed with $1 million capital and is represented by Paul R. Cote, 649 S. Olive St., Rm. 1224. Directors are: Ralph W. James of Pasadena, Ralph G. Wolff and Leonard J. Marquis, both of Los Angeles.

LOS ANGELES—Forrest Mfg. Co. has been incorporated with $200,000 capital to manufacture precision metal products and aircraft parts, by Albert E. Marks, 325 W. Eighth St. Directors are: Albert E. Marks, Aaron Levinson and Sidney J. Dunitz.

THE

"TOGGLE-BUG"



PORTABLE DRILL

The Togglebug is operated by one man. No foundations or fixed shop space is required. Move the machine to the work. Drill stacked plates. Countersink with depth control. Ream with speed.

Standard constant speed model drills up to 1-1/2" diameter holes in structural grade or mild steel. The Togglebug rides the work and can be used anywhere in the shop or yard.

Multiple speed models are made on special order to meet special drilling requirements. Save time and money with a portable Togglebug.

WRITE FOR ALL DETAILS

GUIBERT STEEL COMPANY

1716 YOUGHIOGHENY AVE.—PITTSBURGH, PA.—P. O. BOX 1837

LOS ANGELES—Fabriform Metal Products Inc. has been organized with $200,000 capital to engage in manufacturing and brazing, by Ben Gould, 520 Barlett Bldg.

WATSONVILLE, CALIF.—Leon's Machine Works has been incorporated with $50,000 capital, by Castro & Franich, Register Pajardian Bldg.

ILLINOIS

OGLESBY, ILL.—Oglesby Civic Association, J. Spelich, president, has plans by R. Plhak, La Salle, Ill., for 40 x 100-foot Oglesby plant addition of Eicor Inc., to cost $100,000.

PEORIA, ILL.—Caterpillar Tractor Co. has awarded contract for $8 million KK building and lumber storage shed to S. N. Nielsen Co., Chicago. Giffels & Vallet Inc. and L. Rossetti, Detroit, associated engineers and architects.

INDIANA

FT. WAYNE, IND.—Central Iron & Metal Co. Inc. has filed papers with the Indiana secretary of state evidencing the company's dissolution.

PLYMOUTH, IND.—Argos Foundry Co., William Schlosser, owner, recently suffered damages estimated at $20,000 as a result of a fire.

MICHIGAN

DETROIT—Superior Tank & Welding Co., 8051 Medina St., has been formed with $40,000 capital to conduct a general manufacturing and welding business, by Wallace Tartar, 6436 Yinger Ave., Dearborn, Mich.

NEW YORK

LONG ISLAND CITY, N. Y.—R. Marcus, c/o Jacob Berman, consulting engineer, 24-16 Bridge Plaza South, has plans completed for one-story factory, 47th Ave. between 37th and 38th Sts., to cost $110,000.

LONG ISLAND CITY, N. Y.—Wolff Appliance Corp., 14-40 33rd Ave., has plans completed for manufacturing building to produce home appliances, 41-24 24th St., to cost $125,000.

MASPETH, N. Y.—Circle Wire & Cable Corp., Maspeth Ave., has had plans prepared for factory to produce BX cable, 5500 Maspeth Ave., to cost $420,000.

NORTH CAROLINA

CHARLOTTE, N. C.—Troy Whitehead Machine Co. has awarded contract for local plant to cost $45,000 to Interstate Construction Co.

HIGH POINT, N. C.—High Point Boiler & Tank Co. Inc. has been formed with $100,000 capital stock to conduct a manufacturing business, by John N. Stanley and associates.

OHIO

AKRON—Ornametal Iron Work Co., 929 Sweitzer Ave., expects to begin construction of a $25,000 addition early in the spring.

AKRON—R. C. A. Rubber Co., 1833 E. Market St., C. E. Reiss, president, has announced plans to construct a one-story, 60 x 100-foot shop building.

CLEVELAND—Carpenter Heating & Stoker Co., 1929 E. 55th St., plans construction of a new factory and office building at 2135-53 St. Clair Ave., to cost about $28,000.

CLEVELAND—Lucas Machine Tool Co., 523 E. 99th St., has begun construction of an office and factory building on Kirby Ave., containing 60,000 sq ft of floor space.

CLEVELAND—Consolidated Sheet Metal of Cleveland, Ohio, Inc., 1122 St. Clair Ave., formerly a proprietorship, has been incorporated by Emanuel M. Grossman. The company may announce expansion plans at a later date.

CLEVELAND—Metal Polishing Co., 1382 West Third St., has been formed by Arthur Light, who recently acquired the polishing and buffing division of H. & S. Metal Polishing Co., Cleveland.

CLEVELAND—Cleveland Twist Drill Co., 1242 E. 49th St., plans to spend about $50,000 on construction of addition to dispensary and to provide additional office space.

CLEVELAND—Universal Wire Spring Co., 2260 E. 69th St., has work under way on its $65,000 factory addition. The one- and two-story, 59 x 161-foot structure will provide additional manufacturing space.

CLEVELAND—Taylor Aviation Corp.'s Feick plant, 10225 Meech Ave., and Grave Ave. warehouse properties, plus about 300,000 pounds of aluminum and 40,000 pounds of structural steel at the Alliance, O., factory were sold at auction Dec. 30 as part of the company's reorganization proceedings.

COPLEY, O.—Minnesota Mining & Mfg. Co., Akron-Copley Rd., plans construction of a $200,000 factory and office building.

EAST LIVERPOOL, O.—Leo Capehart, Green Lane, plans construction of an addition to be used for fabricating sheet metal, to cost an estimated $17,000.

ELYRIA, O.—Millford Rivet & Machine Co., W. River St., J. A. Sharkey, general manager, has begun construction of a one-story, 40 x 240-foot factory addition, to cost about $38,000.

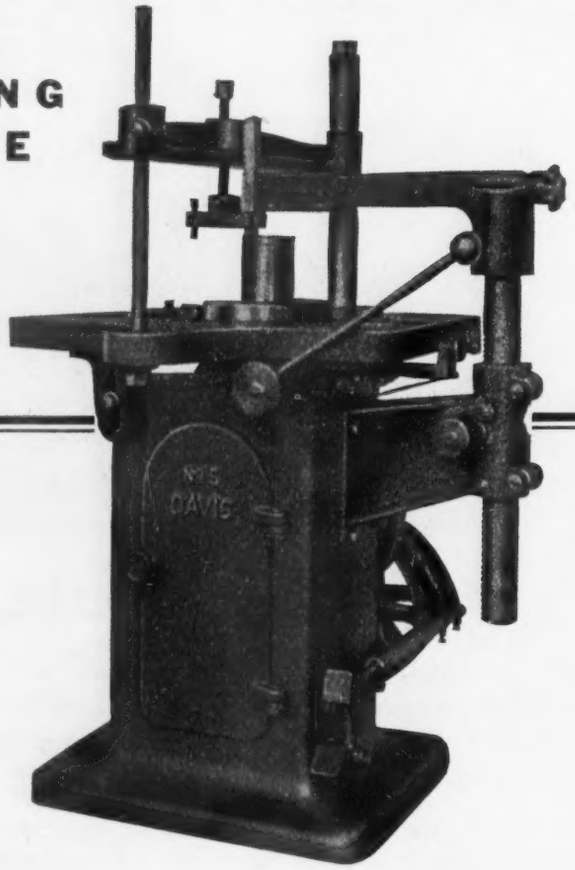
SAYBROOK TWP., O.—Timken Detroit Axle Co., W. F. Rockwell, president, 100 Clark St., Detroit, has plans 75% completed for one-story factory and office, to cost $120,000.

WOOSTER, O.—Duralux Co. has been organ-

New Type

"DAVIS" KEYSEATERS

with
TILTING TABLE



• Taper keyways may be cut by inclining table in either direction from horizontal. Scale indicates exact taper per foot. Cutter operates in vertical position, with resistance arm adjusted to different cutters. Table-type feed with adjustable feed stop.

DAVIS KEYSEATER CO.
397 EXCHANGE ST. ROCHESTER 8, N. Y.

ized with $200,000 capital to manufacture and deal in aluminum and other metals, by Joseph E. Fishelson and John C. Halloran.

YOUNGSTOWN—Graybar Electric Co., 211 N. Champion St., expects to enlarge its warehouse and office building with a one-story, 95 x 100-foot building.

YOUNGSTOWN—Trimedge Industries, subsidiary of Trimedge Inc., 4021 Mahoning Ave., a metal molding manufacturing concern, has been organized and is setting up a plant at 522 Williamson Ave. with production expected to begin soon.

SOUTH CAROLINA

GREENVILLE, S. C.—Greenville Southern Bell Telephone Co., College St., has received CPA approval for construction of $900,000 addition.

TENNESSEE

CHATTANOOGA, TENN.—Mascot Stove Co., A. F. Hahn, general contractor, has awarded the following subcontracts for factory to cost $250,000: Brickwork, Garland Sherman Co., Silverdale Rd.; sheet metal roofing, J. W. Brooks & Sons, 411 W. 21st St.; plumbing, Lucas Bros. & Sons, 2306 Broad; structural steel, steel sash, etc., Truscon Steel Co., Grove St.

MEMPHIS, TENN.—J. I. Case Co. has acquired site for erection of a 100,000 sq ft building to house its distribution branch for farm equipment.

OLD HICKORY, TENN.—E. I. du Pont de Nemours Co., Wilmington, Del., contemplates construction of additional buildings and expansion of cellophane plant, to cost approximately $2 million. CPA approval has been obtained.

TEXAS

DALLAS, TEX.—Lorch-Westway Bldg., c/o Lorch Mfg. Co., has preliminary plans in progress by Thomas, Jameson, Merriell, 810 College St., architects, for construction of two-story factory, Poydras and Wood Sts.

DALLAS, TEX.—Industrial Investment Co. has awarded contract for construction of factory building, Plantation Rd., to be occupied by Trailmobile Co., to Vivrett & Vivrett, Southland Life Bldg. F. J. Woerner & Co., 911 Clermont St., architect.

DEER PARK, TEX.—Shell Oil & Refining Co., Shell Bldg., has awarded contract for construction of glycerin plant, to cost approximately $7 million, to C. F. Braun & Co.

HOUSTON, TEX.—Shell Oil Co., Shell Bldg., has awarded contract for construction of lubricating oil plant adjacent to its refinery on the ship channel, to cost approximately $10 million, to Lummus Co., Mellie Esperson Bldg., and M. W. Kellogg Co., same address.

HOUSTON, TEX.—National Steel Products Co., N. A. Fitch, president, has plans in progress for construction of manufacturing plant, warehouses and offices, Lockwood Dr. at Armour Dr., to cost approximately $1 million.

HOUSTON, TEX.—Crane Co., 22-5 McKinney Ave., has awarded contract for warehouse and office building, Jefferson, Pease, Hutchins and Bastrop Sts., to cost $225,000, to Linbeck & Dederick Construction Co., 1532 Peden St. Lamar Q. Cato, 2103 Crawford St., architect; Robert J. Cummins, Bankers Mortgage Bldg., engineer.

ODESSA, TEX.—Brown Well Service of West Texas, C. C. Brown of Houston, president, has been incorporated with $125,000, by C. L. Bass.

VERMONT

WILDER, VT.—Bellows Falls Hydroelectric Corp., Bellows Falls, is contemplating water power project on Connecticut river between Wilder and Lebanon, N. H., to cost over $1 million.

VIRGINIA

WAYNESBORO, VA.—E. I. du Pont de Nemours & Co., Wilmington, Del., received bids Dec. 16 for research and office building. Consolidated Engineering Co. Inc., 20 E. Franklin St., Baltimore, is prospective estimator.

WISCONSIN

KEWASKUM, WIS.—Kewaskum Utensil Co. has awarded contract for one-story, 80 x 200-foot factory addition to Hron Bros. Inc., 213 N. Main St., West Bend, Wis. J. P. Bruecker, 746 E. Day Ave., Milwaukee, architect.

WEST ALLIS, WIS.—Wisconsin Motor Corp., 1910 S. 53rd St., has awarded contract for design and construction of two-story, 24 x 111 and two-story, 68 x 77 x 100-foot plant additions to Klug & Smith Co., 11 E. Wisconsin Ave., Milwaukee, for an estimated $70,000.

CANADA

COPPER CLIFF, ONT.—International Nickel Co. of Canada Ltd., R. L. Beattie, vice president, has awarded contract for smelter addition to Nordale Construction Co. Ltd., for approximately $7,500,000. I. J. Simcox, c/o owner, engineer.

SCARBORO, ONT.—Allis-Chalmers Rumely Ltd., 1244 Dufferin St., Toronto, has awarded contract for one-story, 160 x 200-foot warehouse and office, Danforth Rd., to Milne & Nicholls Ltd., 57 Bloor St. W., Toronto, for approximately $175,000. Marani & Morris, 46 Bloor St. W., Toronto, architects.

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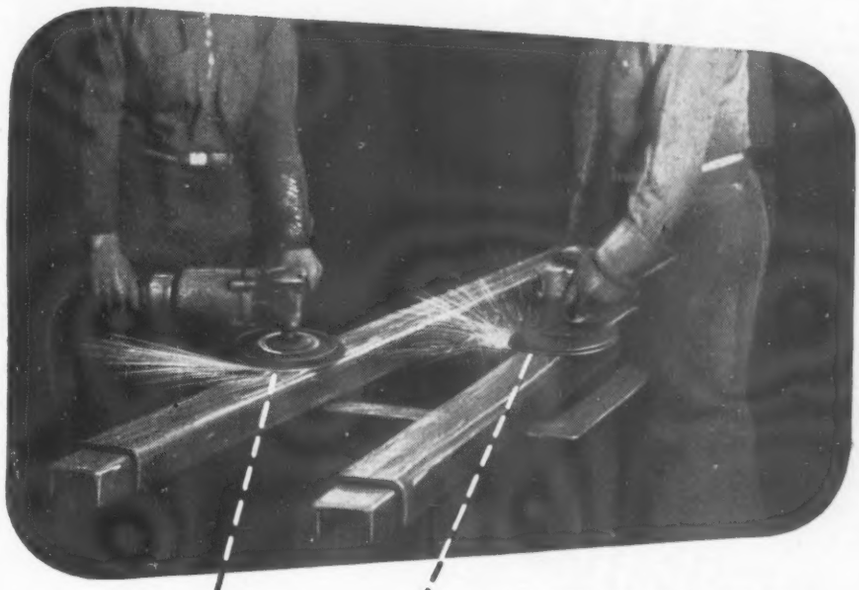

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British Steel Industry Pushing Extensive Modernization Program

(*Continued from Page* 315)

from British mines. But the Minister of Fuel and Power, Emanuel Shinwell, has said that the extra 100,000 tons a week he has asked the miners to produce will not enable Britain to increase her exports. The industrial fuel position shows that some consumers, notably the owners of public utility lighting and heating, have found their stocks at a dangerously low level as it is not possible for collieries to supply more than 75 per cent of the tonnages required against allocations. Many concerns are operating on a hand-to-mouth basis.

An important discovery of a new seam of coal, described as the richest find for 40 years, has been made in Glamorgan (Wales) at the Ffaldau colliery at a depth of about 100 ft below the lowest seam. At this colliery alone it is estimated that the seam will provide something like ten million tons. In this area—one which suffered acute depression between the world wars—work will be found for 1250 men with a daily output of 2500 tons.

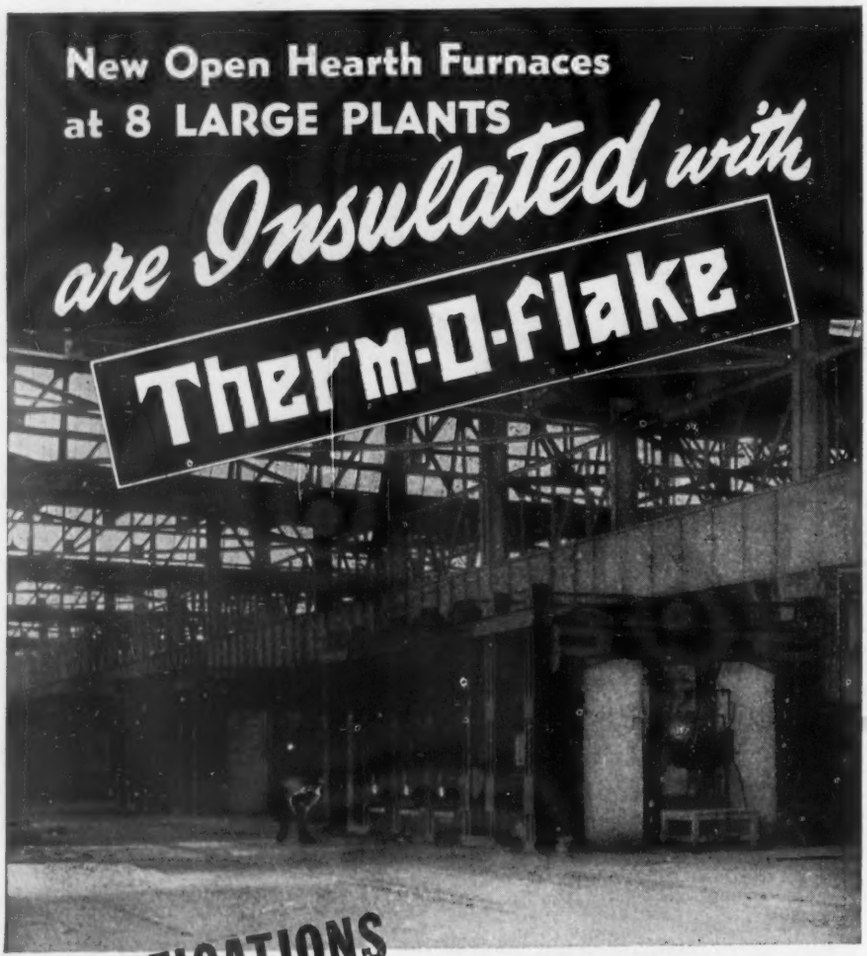
Notwithstanding the uncertainties regarding nationalization the steel industry is proceeding with its 5-year plan for improvement and expansion and important developments are taking place in South Wales, one of which is the bringing of all strip mills operations in the area under a single control. Technical, commercial, financial and administrative considerations all lead to the conclusion that, for speed and efficiency, new hot strip mills and concomitant tin plate and cold reduction sheet mills should form one economic unit under one ownership and management. It is proposed, therefore, to form a new company which will acquire the appropriate assets, including the Guest-Keen-Baldwin plant at Port Talbot and Margam. This undertaking will also assume complete responsibility for the whole modernization program.

Will Operate as Subsidiary

The ultimate capital structure of the company will be settled after the new strip mills have been completed and brought into operation. It will be a subsidiary of Richard Thomas & Baldwins Ltd. The tin plate industry of South Wales was working on Oct. 1 at 67 per cent of capacity as compared with 60 per cent three months earlier, the limiting factor being shortage of labor.

A similar shortage exists in the Sheffield area where production in the steel, engineering and allied trades could be stepped up by 20 per cent given the necessary manpower. Part of the difficulty there is that men have left rolling mills and furnaces for lighter jobs. One engineering firm could employ 200 additional skilled men immediately. Plant in Sheffield has been adapted to specialize in the production of blades and gears for ploughshares and various other agricultural implements in great demand in the domestic market, through the Empire and in many parts of the continent of Europe. These plants are not now fully occupied because of shortages of special steels and several works are occupied only to 75 per cent capacity.

An increase is taking place in merchant shipping under construction in the yards of Great Britain and Ireland. At the end of September the total was 1,-



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Illinois Clay Products Company
JOLIET, ILL.

High Temperature INSULATION

874,878 tons or 109,935 tons more than in the previous quarter and the highest recorded since June, 1922. There was also an increase in the tonnage intended for registration abroad, the figure rising from 105,000 tons in March and 247,500 tons in June to 387,000 tons in September when it represented over 20 per cent of the total. In spite of shortages of steel and other materials, output of new tonnage from Scottish shipyards continues at a high level. For the first nine months the total launched was 290,000 tons gross. In addition to building new ships many firms are also engaged on an exceptionally large amount of work in the repairing and reconditioning of vessels which have been released from government service.

Output of iron and steel in 1946 was at its highest in the second quarter when the annual rate of steel ingots and castings was at just over 13 million tons compared with just under 12 million in 1945 in the same period. In the third quarter of 1946 it was at the rate of 11,963,000 tons. Pig iron production was also highest in the second quarter of 1946 at 7,827,000 tons. It fell in the third quarter to 7,622,000 tons.

Suffer from Labor Shortage

Since the war the foundries have been suffering from a shortage of labor and a number of measures have been taken to relieve it. How far these have fallen short of their object can be gaged from the following figures: Output of iron castings in 1938 was 3,300,000 tons, and current production is at a rate of less than 2,500,000 tons a year. Requirements for the fourth quarter of 1945 were estimated at 669,880 tons and the material allocated was 491,600 tons. For the third quarter of 1946 the requirements were 839,989 tons and the allocation 568,060 tons. For the last quarter the requirements were estimated at 877,279 tons. The determining factor was the shortage of manpower because except for a few categories of special castings there was no lack of capacity. The industry itself has not been lacking in its efforts to build up a sufficient labor force. Schemes have been formulated for the rapid training of recruits, including unskilled men demobilized from the armed forces. Mechanization and modernization schemes involving expenditure up to two and a quarter millions sterling have been brought into being in the past 12 months, and further schemes will be brought forward during the next few years involving expenditure of upwards of two millions sterling a year. In addition the recruitment of 2800 skilled and unskilled foundry workers from Italy has been approved.

BRITISH DOMESTIC STEEL PRICES

(Per gross ton)

	January 1946				December 1946			
	£	s	d	$	£	s	d	$
Foundry pig iron, 2.5 to 3% Si, del. Middlesborough	7	18	0	31.75	8	4	3	33.01
Forging billets, basic soft	14	5	0	57.28	14	10	0	58.29
Merchant bars, under 3-in.	17	13	6	71.05	18	3	0	72.96
Structural steel	15	9	0	62.11	15	14	6	63.11
Rails, 60 lbs and over, 500-ton lots	15	7	0	61.70	15	12	0	62.71
Ship plates, del. Northern area & Scotland	16	4	6	65.22	16	9	6	66.23
Boiler plates, del. Midland	17	4	6	69.24	17	9	6	70.25
Black sheets, 24 gage, 4-ton lots	23	5	0	93.46	24	17	6	100.00
Galvanized corrugated sheets, 24 gage, 4-ton lots	27	7	6	110.04	30	16	0	123.81
Tin plate, f.o.t. makers' works, per box	1	13	0	6.63	1	15	3	7.08

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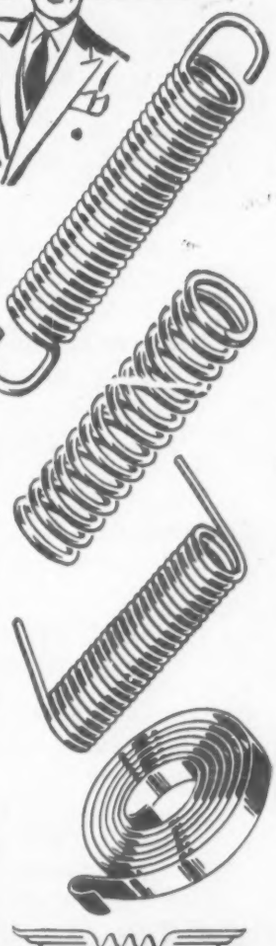

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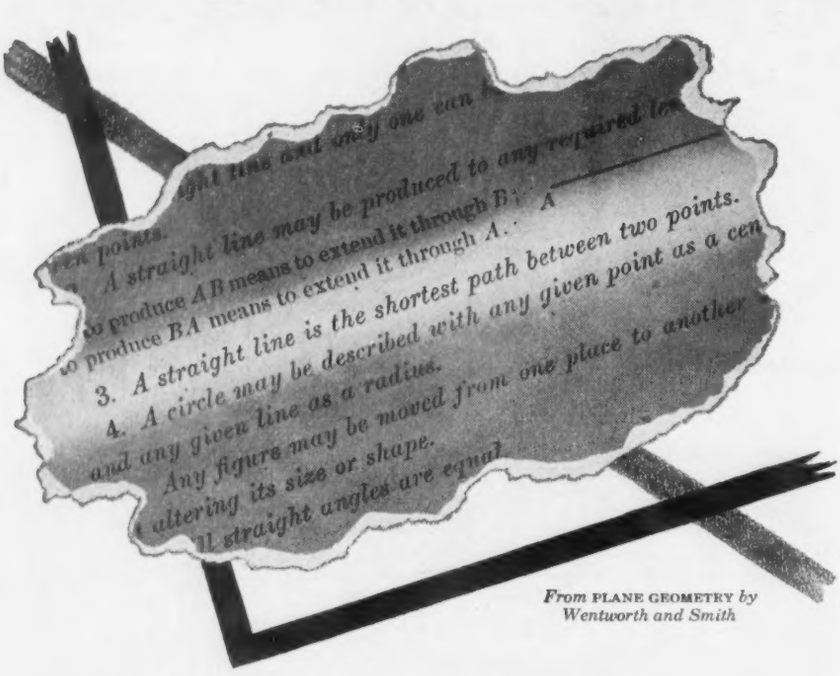
3. A straight line is the shortest path between two points.
4. A circle may be described with any given point as a cen
Any figure may be moved from one place to another
altering its size or shape.
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Take an example. You want a 50-foot length of ⅜-inch steel chain. We make it in our York plant. A "straight line" would be from us to you. Just like that.

But if you had to go direct to manufacturers for all the thousand and one things you have to buy, you wouldn't have time to do anything else.

That's where our distributor comes in. He is doing his best to keep a full assortment of all the chains we make—in all the sizes you need. We're doing our best to keep him supplied. So that you can pick up your phone and get what you want—when you want it.

So the "shortest path" between our chain mill and your plant is by way of an American Chain distributor. His business is to serve you with products and up-to-the-minute technical information about them. He is responsible to you just as we are responsible to him for the quality of the products we make for your use.

We offer you the best chain and chain fittings we know how to make. And, so that it will be easier for you to buy, we say . . . "Get in touch with our distributor."

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AMERICAN CHAIN DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

In Business for Your Safety

French Industry Progress Hinges On Coal Supply

(*Continued from Page* 317)

The Offices Professionals **which succeeds the organization committees set up by the Vichy government have now been disbanded. The interests of the iron and steel industry are now taken care of by the *Chambre Syndicale de la Siderurgie*, Affiliation to this body is not compulsory as was the case in the previous setup, but as the *Chambre Syndicale* is responsible for the allocation of raw materials, all works are, in fact, members. *The Chambre Syndicale* is in most respects the same organization as the prewar *Comite des Forges*, but its functions are much wider, since it is charged with the allocation of raw materials, and the planning of production. It is assisted by a technical committee and an institute of metallurgy, which disposes of a central research laboratory.**

The tendency is more and more to rationalize the industry and to concentrate a certain type of production to each works. This is relatively easy at present because the mills have their order books filled for many months to come, and they can plan their rolling programs accordingly. Deliveries for sheets, for instance, are extended to 18 to 20 months. There is a system of priorities for the coal mines, electrical works, the railroads, etc. Allocations are made by means of tonnage vouchers given to the various industries in accordance with priority of their work. As an example, the railroads are given priority for their rolling stock and signalling equipment, but for the replacement of rails their tonnage vouchers are severely restricted. Next to the *Chambre Syndicale*, the ***Comptoir Francais des Produits Siderurgiques*** continues to function and allocates contracts and orders to the various iron and steelworks under the direction of the *Chambre Syndicale.*

Some talk about nationalization of the industry is heard. So far, the only plan of nationalization has been propounded by the Communist party. The plan provides for the separation of the industry by districts; there would be a corporation in the north of France, in the east, the center and the west. Thus, modernization and development would be effected by regions. It is proposed to indemnify the owners up to a point, but excepting certain concerns in the east of France, which would simply be taken over. The plan, which covers only those

works that operate blast furnaces, is not likely to come into being, unless the Communist party gains and holds control of the country for a considerable period.

The manpower problem is only serious insofar as the industry requires more specialized workers. There is no unemployment and, in fact, the industry employs men from Italy and Holland. There is a risk, however, that certain works, specially in the north, eventually may have to suspend work if the shortage of certain raw materials becomes worse.

As has been previously stated, wages were controlled and fixed up to a certain ceiling until the middle of 1946. Then the *Confederation Generale du Travail*, or general French trades union, obtained from the second constitutional assembly, a directive that wages should be increased. The increase finally granted by the government was somewhat less than the 21 per cent which the French chamber had accepted, but a larger increase was made in family allowances. As is usually the case, the increase was soon followed by an increase in living costs, so that no one is better off.

Water Power To Be Harnessed

Basis for plans for the development and improvement of the industry is to find means to make up for the lack of coal. An elaborate plan is now under way to harness water power in the basins of the rivers Rhone and Dordogne in the center and southeast of France. One large dam at Genissiat, on the Rhone, will provide 280,000 kilowatts at the start, and this will be increased to 400,000. Work is soon to be started near Montelimar for a dam which will extend over 25 kilometers in length, 70 meters wide, with a depth of 12 meters. Other dams are either planned or under way.

Measures also are being taken to substitute fuel oil for coke, for use in open hearth and reheating furnaces. It is proposed to use the fuel oil direct, or in conjunction with blast furnace gas. The equipment being relatively simple and with fuel oil supplies likely to be adequate, it is expected that the adoption of these proposals will be quite extensive.

In the works proper it is proposed to modernize or replace 20 blast furnaces, and to realize in each case a uniform capacity of 600 tons. The item of greatest interest in the steel industry is the erecting of two continuous strip rolling mills, one in the north of France, the other in the east. The erection of the first of these two plants is to proceed immediately at Denain; it will have a capacity of from 600,000 to 800,000 tons of sheets

Production Screwdrivers

Speed up

YOUR SCREWDRIVING ASSEMBLIES BY USING THESE MACHINES

Model B Will Drive Screws from No. 6 to No. 1/4, in Lengths 3/16 to 1 1/2 Inches

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All Screws Driven to a Uniform Tension

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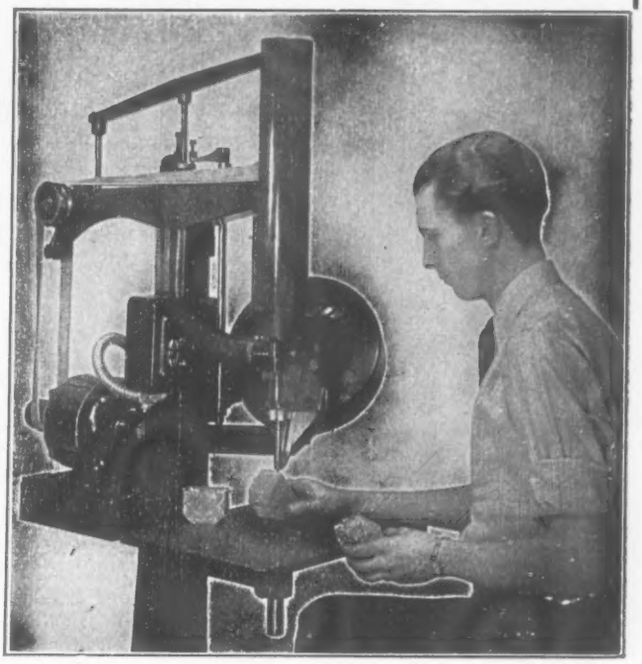
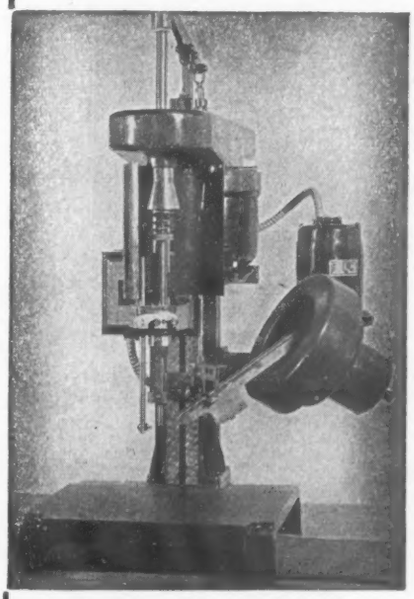


MODEL B

MODEL A



Model A Is Designed to Handle Small Screws in Sizes From No. 2 to No. 6 In Lengths From 3/16" to 3/4".

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Fast **Tough**

Heavy feed at high speed!

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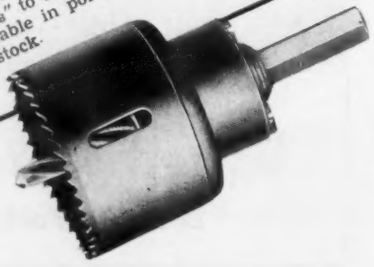
The same exclusive *unbreakable* feature of MARVEL Hack Saw Blades is also a feature of MARVEL Hole Saws, giving these saws the ability to stand up under abuse. MARVEL Hole Saws cut holes from 5/8" to 4 1/2" diameter in stock up to 1 1/8" thick. Usable in portable drill, drill press, or lathe tail stock.



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per year, and will be operated jointly by *Societe Francaise de Denain Anzin* and *Societe Metallurgique du Nord et de L'Est*. The sheets will be made at the Denain strip mill from basic bessemer slabs, and the Perrin process will be used for the preparation of the metal; the sheets will then be transported by river and canal to the Montataire mills of the associated company, to be finished or made into black plates. The plant is being purchased in the United States, but it will be two or three years before installation can be completed and full production reached.

Taking a general view of the situation of the industry in France at the beginning of 1947, it can be said that the prospects would be good providing two main conditions are realized: That coal and coke supplies be adequate; and that the danger of inflation be averted by a strong policy on the part of a stable government. If both these conditions are not fulfilled, the French steel industry will be unable to recover its prewar status, to the detriment of all of the other industries which depend upon it for their existence.

Woven Wire Products Group Elects Officers, Directors

Election of officers and directors of the Woven Wire Products Association was an important part of the business of the association's annual convention, held in the Brown Hotel, Louisville, recently. Results of these elections were: Raymond E. Morrison, president; Joseph P. Weis, vice president; Fred F. Anderson, treasurer; Oscar M. Diezel, executive secretary; George Busch, Robley J. Ebert, Harry E. Gieseking, Ralph R. Estay, George C. Koltz Jr., Bert M. Meadow, Jesse B. Palzer, and Edward H. Kitzelman, directors.

Production Begun at New Plant of Cameron Iron

Cameron Iron Works, Houston, Tex., manufacturer of oil well drilling and other oil field equipment and machinery, recently began operations at its newly completed $3 million plant at Katy and Silber Roads. The plant, which is located on a 60-acre plot, contains more than 250,000 sq ft of floor space. It includes a main building in which administration offices, warehouse and machine shops are located, a tool and die shop, a personnel building, a forge shop, and miscellaneous buildings.

The company's old site at 711 Milby St. will be offered for sale, company officials stated.

Belgian Output Gains Despite Acute Shortages

(*Continued from Page* 317)

months of 1946 were 1,093,184 metric tons having a value of 5,162,667,000 Belgian francs ($117,333,000); the main products exported were: Hoops 774,526 tons; merchant steel 352,298 tons; structural steel 197,930 tons and sheets 172,674 tons; wire rod 59,360 tons; rails 55,269 tons.

The general organization and the defense of the interests of the industry are in the hands of the *Groupement des Hauts Fourneaux et Acieries Belges* or council of the Belgian blast furnaces and steelworks.

Tonnages of steel products available for the domestic market depend on the tonnages sold in export markets. Statistics are established at quarterly intervals and rectified during the following quarter. For the fourth quarter of 1946 a tonnage of 108,000 metric tons was allocated to the domestic market.

Government Fixes Prices

Within the limits of allocations for the domestic market, sales to domestic consumers are free, but selling prices are fixed by the Ministry of Economic Affairs. The following prices of a number of staple products were fixed in August, 1946. Sales are made at these prices subject to revision following an inquiry which is being made about production costs, the producers alleging that the prices are not sufficient to allow a reasonable margin of profit:

	(per metric ton) Belgian Francs	$
Foundry phosphorous pig iron	1,920	43.63
Foundry hematite pig iron	2,600	59.10
Billets	2,450	55.70
Structural steel	3,050	69.32
Merchant bars	3,150	71.59
Plates	3,250	73.86
Sheets	3,900	88.63
Wire Rod	3,250	73.86
Hoops	3,550	80.68
Rails	3,600	81.82

Throughout the year 1946 there were sporadic strikes in Belgium caused by demands for higher wages, which the employers were reluctant to meet. The government itself tried to stop the tendency for wages to mount higher and higher, and followed a deflation policy; thus the Van Acker government, in the earlier part of the year brought about a reduction of prices of about 10 per cent. However, the workers did not consider that the reduction in the cost of living was sufficient and they demanded an increase of 25 per cent in the level of wages; these demands were made in

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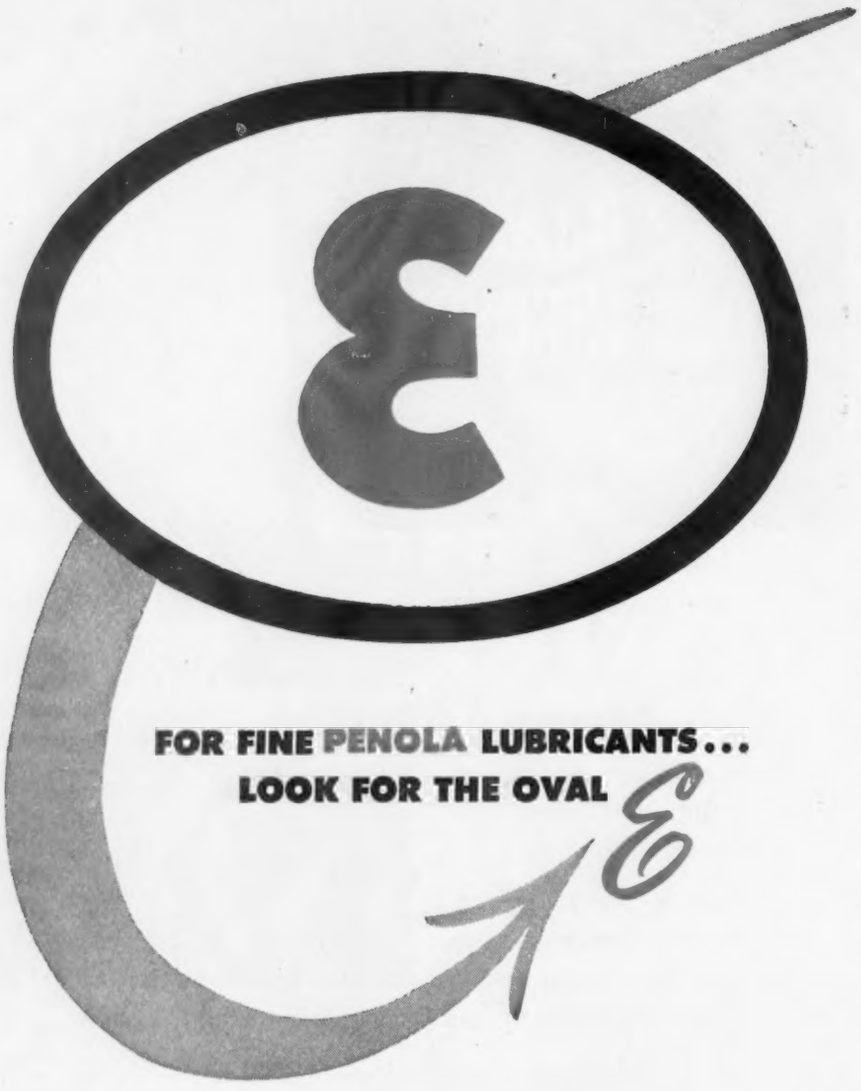

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July and August and were only partly satisfied. Despite this, the strikes that did take place were mainly of a local character and generally not supported by the unions. Actually the policy of the Belgian unions is to try and avoid general increases of wages, realizing that these only result in an increasing tendency toward inflation. On the other hand, there is a shortage of labor, especially of skilled and specialized labor. Some workers have been imported from Italy, but the shortage will be acute when all German prisoners are repatriated.

In summary it can be said that there is a definite trend toward rising production in Belgium; the people are working satisfactorily; conditions since the liberation of the country have considerably improved; the general organization of industry works sufficiently well to encourage the nation to forecast the future with calm and optimism, provided political strife can be avoided.

Steel Exports To Expand As Production Permits

(*Continued from Page* 319)

duced directly for export last year as being between 5 and 6 per cent of the total finished steel shipments. However, in arriving at an estimate of total shipments leaving this country, other factors had to be taken into account—notably steel products which moved indirectly through jobbers and the War Assets Administration. Best estimates as to the total volume of this additional tonnage ran around 2 per cent of total finished steel shipments, or maybe a fraction over. This year, though, surplus war material will be a lesser factor, as most has been sold.

Steel institute returns for the first seven months also indicated that of the approximately 1,400,000 tons exported directly by steel producers, the principal movement was in sheets, with hot and cold-rolled and finished grades totaling 234,000 tons for the period, and with semifinished, including skelp and wire rods, falling second with a total of 218,800 tons. Next in order was tin plate and black plate at 186,000 tons; plates at 158,500 tons and pipe and tubes at 147,100 tons. Shapes amounted to 106,600 tons; hot bars, 91,400 tons; rail, 82,200 tons; reinforcing steel, 73,300 tons; and wire, 55,100 tons. Hot and cold strip totaled 36,900 tons.

Interestingly, exports as reported by the steel producers jumped from approximately 448,000 tons for the first three months to 1,139,200 tons for first six months, with the 279,600 tons in July being the largest single monthly total

exported up to and including that time.

Latin American countries, with large orders placed in 1945 and early in 1946, and in the aggregate being the largest recipients of steel exported from the United States last year, are still pressing for a wide range of commercial products, including oil country pipe and particularly reinforcing steel for road construction.

European prospects are more encouraging this year, particularly with regard to England, France, Holland and the Scandinavian countries.

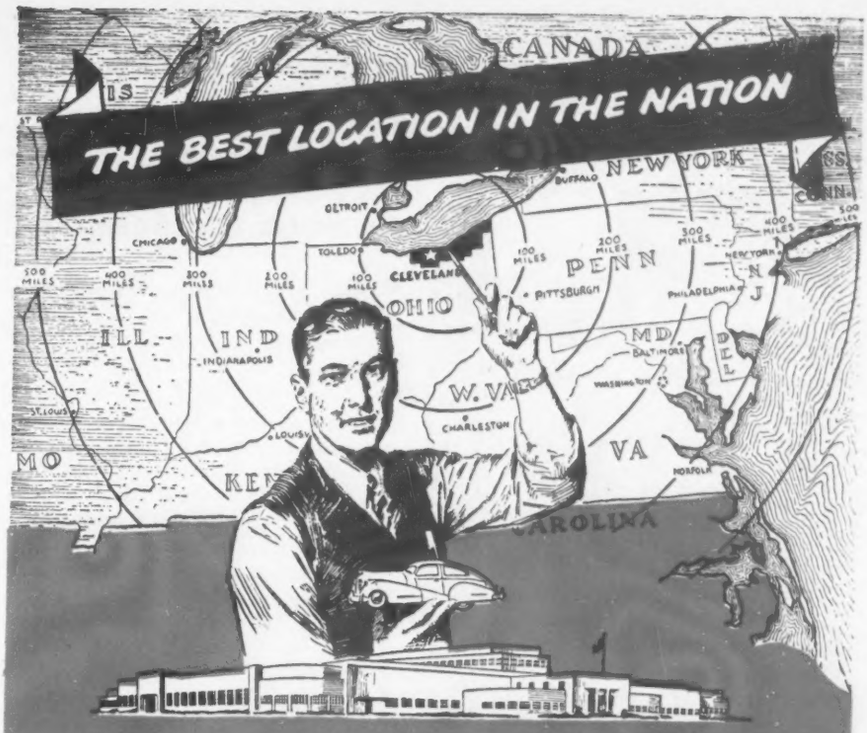
Due to restrictions on dollar exchange transactions, India's purchases have been confined largely to British empire and sterling block nations. However, under the United States loan to Britain, India should be able to trade more freely in dollar exchange. In fact, her importations of steel from this country have been increasing recently, including tubing, bolts and nuts, some wire and some sheet products.

Chinese total imports from this country during the first eight months of last year was, exclusive of UNRRA, up to the level of many of the best prewar years. This was encouraging. Also considerable progress was made last year in surveying China's industries and in making long range plans for reconstruction and development. Promising, too, is the commercial treaty recently signed by the United States and China, and now awaiting formal ratification by the two governments.

The proposed government allocation program set up early in the year for the war-devastated countries came in for considerable battering around, apart from the tin plate program, and even it was substantially modified, with shipments averaging about 120,000 tons a quarter, or approximately 15 per cent of the total amount of tin plate produced in this country.

Program Upset by Strikes

Originally, aproximately 850,000 tons of steel, apart from tin plate, was scheduled to be sent to the war-devastated countries during the first half under government allocations. The steel strike early in the year knocked this program in the head and it was given a further set back in the spring by the 57-day tie-up in the soft coal mines. Subsequently, the program was revived on a modest scale only again to be postponed by the marine strikes. Eventually, it reappeared late in October when approximately 280,000 tons were allocated for shipment over the following four months—from November through February of this year. These allocations involve plates, reinforcing steel, merchant bars and some relatively small quantities of pipe, wire products, sheets and shapes. The plate allotment was by far the largest.



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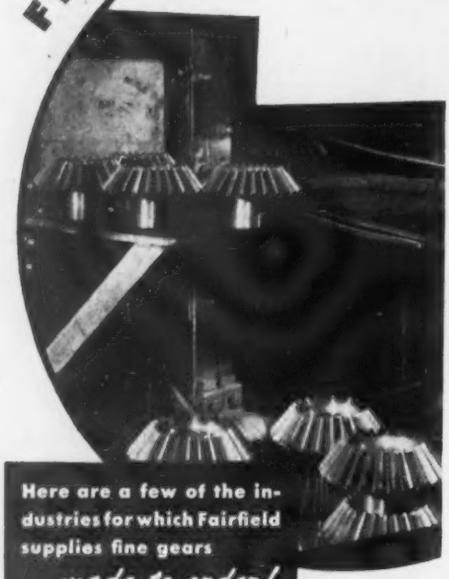

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Europe Limited By Shortages in Recovery Drive

(*Continued from Page* 313)

000 tons (260,000) and 2,470,000 tons; for Poland 1,150,000 tons (525,000) and 1,420,000 tons; for Czechoslovakia 1,700,000 tons (950,000) and 2,281,000 tons. Germany, of course, is in a special position and may produce just under 3,000,000 tons in 1946, as against 19,531,000 tons in 1937. With the addition of the production of Austria, Italy, Spain and Sweden, one arrives at 11 countries which will have an estimated output of some 28 million tons of crude steel in 1946, as compared with 19 million tons in 1945 and 54,527,000 tons in 1937. Thus, while in 1946 these countries will have produced about 9 million tons more of steel than in 1945, there will be a reduction of no less than 26,500,000 tons from the output of 1937.

To complete the picture it can be mentioned that four or five year plans elaborated by certain countries provide for higher outputs by 1950 than these countries were reaching in 1937. Thus Great Britain hopes to attain a tonnage of from 15 to 16 million tons, France 10 million tons and eventually 15 million tons if and when the Monnet plan is completed; the present capacity of the works is about 12 million tons. Czechoslovakia expects to produce 2,200,000 tons or approximately the prewar rate by 1948. Russia, whose production at present is not known with precision, plans an output of some 25 million tons by 1950. It is also interesting to note that Canada, India, South Africa and presumably Australia, are already producing more steel than before the war.

25-Million Ton Shortage

Reverting to the present position, and even assuming that Russia may be producing at the prewar rate of about 18 million tons, there is a shortage of steel production, in Europe alone, of some 25 million tons, which is aggravated by the fact that the requirements of steel for rehabilitation purposes, over and above normal requirements, call for a much greater output than in the years immediately preceding the war. In Great Britain, owing to the priority given to housing, other consuming industries such as automobile, shipbuilding, machine tools, are having their supplies of steel curtailed. The same condition applies to France in regard to automobiles, railroad material and agricultural machinery,

and again to Belgium and other countries of Europe.

These conditions naturally have marked repercussions on import and export trade. Three European nations are competing at present in iron and steel export markets: Belgium and Luxemburg who form one economic unit for the purpose, and Great Britain. Current French exports are at a very low level; Sweden exports small tonnages of special steel products, and Czechoslovakia has a limited European export trade, mainly on an exchange basis against coal and manufactured products.

At the beginning of 1946 the British government, anxious to improve the nation's foreign exchange position, had planned, through the Board of Trade, an export program of 1,600,000 tons of iron and steel products for the year. However, the considerable tonnage required for housing and reconstruction, coupled with a serious reduction of expected imports of ingots and semifinished steel, forced a reduction of the export quota to be made, down to an annual rate of one million tons for the third quarter of the year, and a further reduction was anticipated for the fourth quarter, shipments being limited largely to certain classes of products specified by the government.

Export Program Curtailed

Early in the second half of the year the Belgian and Luxemburgian governments also found it necessary to curtail the export program which they had planned at the beginning of 1946. This was due largely to difficulties in regard to coke supplies, principally from Germany, and to the amount of steel needed to manufacture machinery and engineering equipment both for the home and export markets. Thus the race between Great Britain and the Belgo-Luxemburg group was slowed down. From January to September, 1946, Great Britain had exported 1,766,245 tons of iron and steel products (1,436,906 tons in the corresponding period of 1938), against 1,092,732 tons of Belgian and Luxemburgian exports. It will be seen that by the end of September Great Britain had already exceeded the export tonnage officially planned for the whole year.

British exports went mainly, and in order of highest tonnage, to South Africa, Denmark, Holland, Egypt, Palestine, Argentina, Iran, France, Norway and India, each of which countries took between 180,000 and 50,000 tons of iron and steel products. The principal commodities exported from Great Britain were: Plates and sheets, railroad material, merchant steel, tubes, and structural steel, each of which items contributed from 290,000 to 110,000 tons of the total. In addition, Great Britain,

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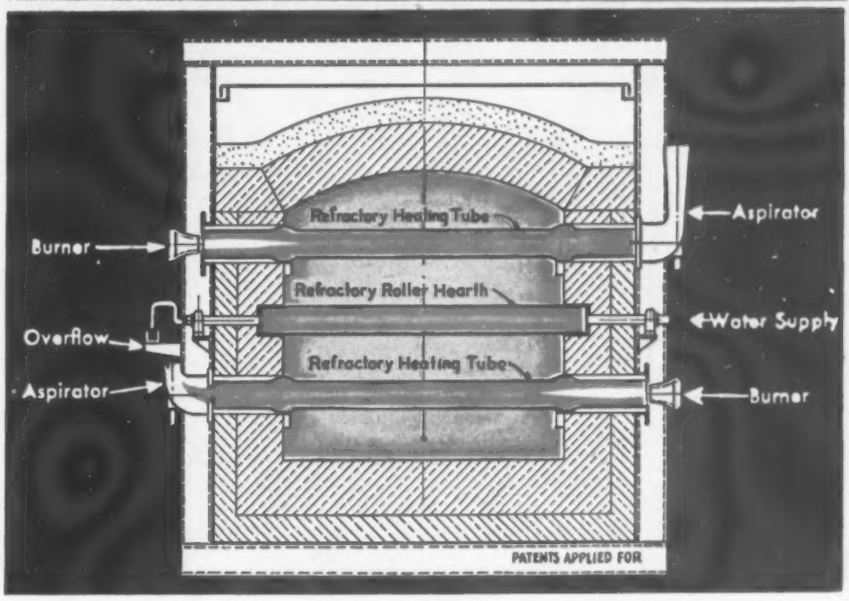

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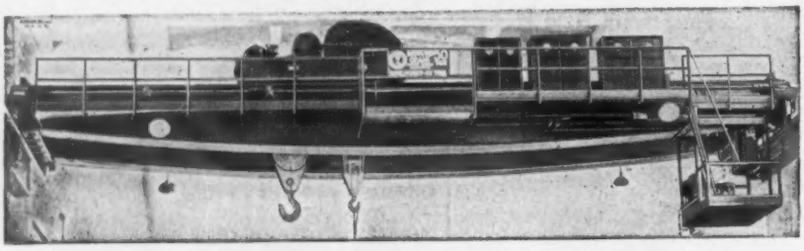

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in the first nine months of 1946, exported 341,684 tons of machinery and parts (344,447 tons in the corresponding period of 1938) and 60,954 motor vehicles, private and commercial (35,640 in the first nine months of 1938). In the same period of 1946, Belgium and Luxemburg exported their iron and steel products mainly to Holland, Switzerland, Sweden, Argentina, Denmark and Norway; these exports were mainly comprised of structural steel, merchant bars, plates and sheets, hoops, and wire rods and wire products. It should be noted, however, that Belgian and Luxemburgian works received inquiries from all parts of the world, which they are at present unable to satisfy. Much of this business is transacted by reciprocal commercial agreements with the importing countries.

When production of iron and steel in Great Britain, and in Belgium and Luxemburg, again reach such proportion as to allow the removal of limitations against exports, the two groups will face each other again. Britain will enjoy a strong position on account of the considerable extension and modernization of works planned for the next four or five years. Britain also has a number of established markets in the dominions and colonies, but these markets are not quite as assured as in the past because the larger dominions, Australia, Canada and South Africa, and also India, have increased their own means of production, not only in regard to crude iron and steel but also in the metalworking industries. Britain will therefore have to face American, and Belgian and Luxemburgian competition in the other world markets as well.

On prices, Britain, and Belgium and Luxemburg are competing keenly. The Belgo-Luxemburg group have made commercial agreements with a number of other countries, to which they have arranged to sell tonnages of iron and steel products, over periods of 12 months, under certain price agreements. While Belgian and Luxemburgian prices are sometimes lower than British, the reverse case also happens; British prices are usually lower for plates and sheets for example, but commercial agreements such as have just been mentioned do give a certain advantage to the Belgian and Luxemburgian works.

BRITISH EXPORT PRICES

	£	s	d	$
Plates ⅜ in. and up	18	8	0	73.96
Medium plates ⅛ in.	22	7	6	89.94
Boiler plates	19	5	6	77.48
Angles, beams (heavy)	17	13	0	70.94
Angles, tees 4 in. and under	20	11	0	$2.60
Rounds, squares 3 in. and up	18	13	0	74.96
Rounds, squares under 3 in.	20	11	0	82.60

Costs of production are growing apace in every country, due mainly to high wages and higher prices for coal and scrap. In Great Britain, domestic prices

were raised in two stages during 1946, but the total increase ranged only from about 6s ($1.20) per ton for foundry pig iron to about 10s ($2.00) for merchant steel, 32s 6d ($6.50) for sheets and 68s 6d ($13.70) for galvanized corrugated sheets; the average overall increase of prices was therefore less than 10 per cent. In Belgium and Luxemburg a substantial rise of domestic prices took effect as from Aug. 1, the increase for foundry pig iron being 20 per cent, and for steel bars as much as 40 per cent.

French prices increased similarly in September, but in view of the fact that the French franc is depreciated in relation to the Belgian franc since the beginning of 1946, French domestic prices continue to be comparatively lower than the Belgian. Whatever price adjustments may be in store in 1947, there is no doubt that American steel and machinery exporters will have to face strong competition from Great Britain, Belgium and Luxemburg, if not in the Far East, at least in South American and other world markets.

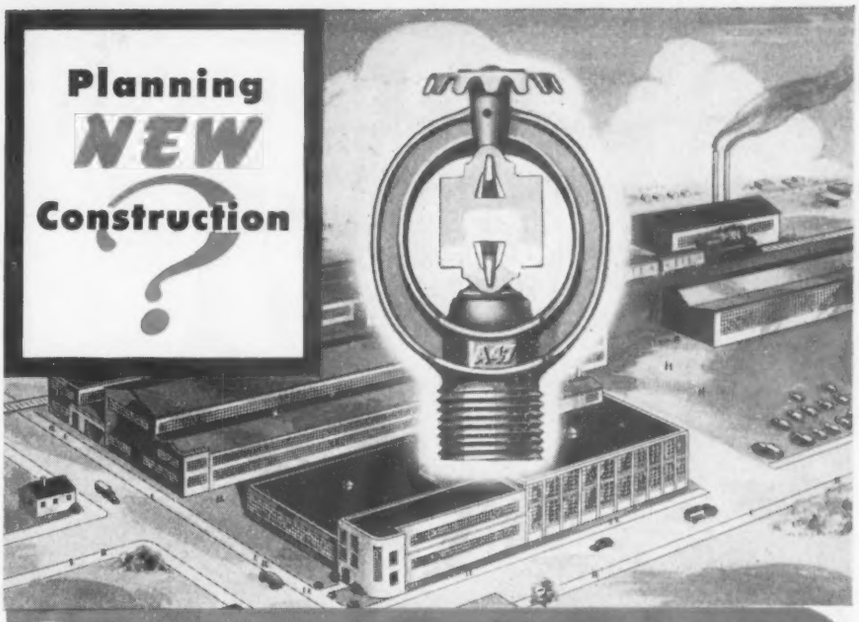
Export trade will be affected to some extent by the nationalization schemes, either actual or potential, which certain governments or parties are favoring. In the coming year little change is to be expected from the present position in Great Britain, where the National Steel Board is constituted and will continue to exercise control over privately owned industry. France has no official all-in plan for nationalization, although the Communist party has evolved one on broad lines. In Poland most of industry is nationalized and a similar trend exists in Czechoslovakia.

British Firms Announce Large Expansion Program

Expansion plans of the United Steel Companies were recently announced by Sir Walter Jones, chairman. The most important part of the program of this large British combine is the plan for conversion of an ordnance plant at Workington, Cumberland, Eng., to production of mine cars, and coal-cutting, conveying and loading machinery of American design.

In Sheffield, Eng., one-third of the furnaces at the steel-melting shop are being converted to burn fuel oil. Some of the furnaces have been improved and fitted with steam boilers to utilize waste heat. Another new plant in Sheffield to increase the output of stainless sheets is expected to be ready by the middle of next year.

A new cogging mill and steel-melting shop are scheduled for completion within a few months in Lincolnshire.



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Steel Industry Showing Fair Despite Strikes

(*Continued from Page* 321)

steel was left entirely up to the discretion of the producing mills.

Throughout the year the steelmakers distributed tonnage to consumers on a quota basis determined on prewar consuming demand. For the most part this system worked out satisfactorily except that the imposition of priority ratings for housing and other emergency requirements at times disrupted rolling and shipping schedules.

According to the American Iron & Steel Institute practically all of the major consuming groups received a larger ratio of total shipments during the first six months of the year than they did in 1941. Among those receiving a larger share were the automotive industry, container manufacturers, jobbers and distributors, steel converters and processors, machinery builders, industrial equipment and tool manufacturers, electrical machinery builders, manufacturers of railroad equipment, the pressing, forming and stamping industry, and other lines making consumer durable products. Indications are this ratio was maintained in the closing half of the year.

Consumers Fare Well

Distribution data for all of 1946 are not available but figures for the first seven months of the year show the major steel consuming industries fared well in receipt of tonnage. For the first seven months consuming industries ranked in order of tonnage taken as follows: 1—Automotive, 2,646,145 tons; 2—construction and maintenance, 2,303,965; 3—containers, 2,257,502; 4—rail transportation, 1,807,300; 5—machinery, industrial equipment and tools, 1,112,729; 6—contractors' products, 751,725; 7—domestic and commercial equipment other than appliances, etc., 692,796; 8—appliances, utensils and cutlery, 642,309; 9—electrical machinery and equipment, 564,035; 10—agricultural equipment, 517,209; 11—shipbuilding, 138,119; 12—oil and gas drilling, 111,881; 13—mining, quarrying and lumbering, 92,179; 14—ordnance and other military, 23,702; 15—aircraft, 12,307. These 15 classifications do not include shipments to warehouses, to converters and processors and for exports. The first of these three latter categories received 4,655,996 tons in the period, the converters and processors, 2,011,174 tons, and for export, 1,418,709 tons, out of overall

total product shipments of 24,643,838 tons in the seven months.

From a market standpoint the year was one of pressing demand and for the most part relative stability in prices. Right from the beginning of the year producers were swamped with orders and had scarcely begun to get rolling schedules into shape when the steel strike broke out in January and continued until mid-February. Settlement of the strike on the basis of an 18½ cents per hour wage increase was followed by a period of recovery in production, which continued until April when the coal strike dealt operations another haymaker and threw all schedules askew. After the coal strike ended late in May ingot operations again climbed rapidly, holding around 90 per cent throughout the summer and fall until late November when John Lewis again forced a suspension of mining and an accompanying reduction in steelmaking.

Supply Shortages Felt

Major steel supply shortages existed last year especially in the so-called light items, such as sheet and strip, tin and terne plate, wire and wire products, black plate, conduit and light tubing. However, production was stressed in these divisions all year long and of total tonnage shipped the proportion of light products, used chiefly in the manufacture of consumer goods, was higher than in any year since 1939. In one month, May, shipment of these products actually exceeded the movement of heavy items for the first time on record.

Reflecting the heavy order position of the mills, at midyear shipments were behind schedule 8 to 12 weeks on some commitments, and in a few cases even further. Some improvement in conditions accompanied the stepping up of steel production schedules through the summer and fall months following the coal strike, while the action of producers in encouraging consumers to cancel delinquent tonnage, some of which dated back to second quarter, served to wash out some tonnage from order books. Toward the close of the year the mills were making every effort to fit bookings and order backlogs to potential production, and reported considerable success in reshaping projected schedules. However, the mills entered the last quarter of the year with order books bulging and there was little prospect that conditions would materially improve until well into the new year.

In sheets, for example, demand was almost as pressing as the year ended as it was during earlier months, and in the case of most producers quotas had been set up for first quarter of 1947

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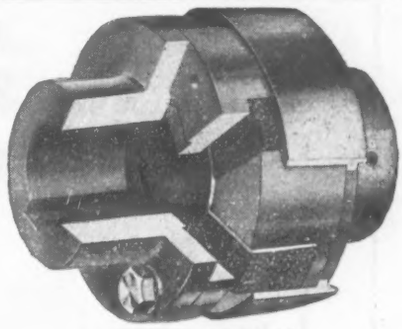

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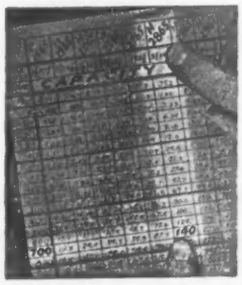

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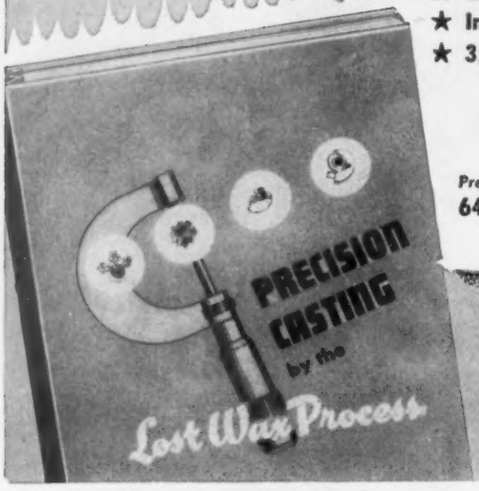

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leaving virutally no open tonnage before April. Reflective of the tight position which prevailed in the flat rolled steel market all last year was action of the government in subsidizing sheet bar purchases for several small nonintegrated sheet mills in an effort to keep them in operation. This was the first time in history that government subsidizing of steel purchases for private interests had been resorted to and was necessitated by the inability of these small mills to obtain sufficient semifinished material from the larger producers at established OPA ceiling prices to sustain operations.

Some producers of hot-rolled carbon steel bars at the yearend could accept tonnage in the larger sizes for late first quarter delivery, but most of them were virtually sold out for the period. As a matter of fact, it was estimated that all producers of carbon bars had arrearages when the year ended which in some cases will account for at least five to six weeks rolling capacity. Alloy bars were in easier position with first quarter tonnage available in some sizes.

Overall plate demand has held up exceptionally well in recent months and expanding requirements are indicated through most of 1947. Producers have been under pressure to meet heavy requirements of freight car builders, and for tank, barge and heavy machinery fabrication.

Curbs Limit Shape Demand

Imposition of government curbs on so-called nonessential construction in an effort to divert materials to housing, served to hold down structural shape demand in the latter months of 1946. Because of these building restrictions fabricators were making heavy inroads on order backlogs, the overall backlog of the fabricating industry dropping more than 50,000 tons in the closing two months of the year.

Wire mills generally enter the new year with heavy backlogs, first quarter capacity being filled despite producers' efforts to wash out tonnage long overdue.

Conditions were similar in virtually all the specific product markets throughout the year with consumer pressure constant and the mills handicapped in their efforts to match demand by interruptions in production schedules. Corrective action in stripping order backlogs of delinquent tonnage should have a salutary effect on shipping schedules early next year but indications are it will be mid-year before any substantial easing of pressure for shipments will become apparent.

Pricewise the steel market was relatively stable for most of the year. In February a general overall average price increase of $5 per ton was allowed by the Office of Price Administration to

compensate for the 18½ cents per hour wage increase granted the steelworkers. This price increase worked out to advances ranging from $2 to $12 per ton on specific products. At various times throughout the year OPA permitted individual producers to mark up certain prices on which production losses were shown. In March an increase of 75 cents per ton was allowed on pig iron this being the third boost since 1941. Another increase of $2 per ton was authorized in August, this being made retroactive on adjustable contracts to June and still later premiums of $8 to $12 per ton were authorized to encourage relighting of idle blast furnaces whose product was urgently needed in the production of housing items. Advances were also allowed on nails to stimulate production for housing, and on bolts, nuts, screws and rivets, cast pipe, and various other items, including iron ore and cast grades of scrap.

Steelmakers did not take advantage of the opportunity to raise prices when price control was temporarily suspended upon expiration of the original price control law at the end of June. Since there was every reason to anticipate reimposition of control with resulting rollback of any price increases, the steel producers decided to hold their position pending developments. However, when price control was finally lifted late in the year the smaller steel interests almost immediately advanced quotations especially on sheets and strip, and within a few weeks the larger makers had followed. As the year ended a general upward movement of prices appeared under way.

Extra Cards Revised

A significant point in connection with these late year price changes was the fact that base price adjustments on some products were being accompanied by comprehensive revisions in extra cards, the net result being that price changes ranged from slight reductions in base quotations on certain items to sharp increases to consumers if changes in extras are considered. For the most part the revised extra cards reflect discussions over the past two years between steel producers and the now defunct Office of Price Administration.

A significant market development of the past year was the tendency of steel producers to be more and more selective in accepting orders. For example, sellers increasingly tended to confine sales efforts to markets close to producing plants, in some instances withdrawing entirely from distant areas. More and more the trend has been in the direction of holding freight absorption to a minimum, and this tendency is expected to increase with freight rates going up

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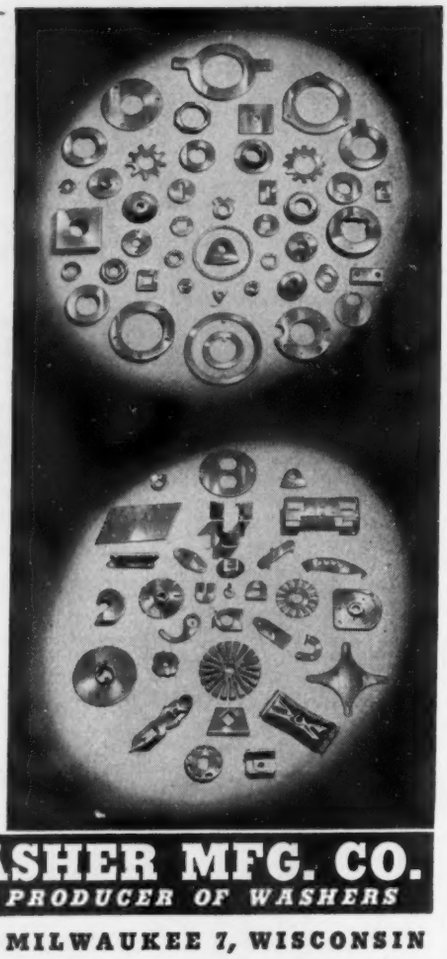

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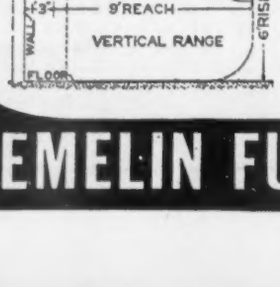

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Jan. 1. As a result of this contraction in markets some consumers have been forced to search out new supply sources, a difficult task in the tight markets which have prevailed the past year. The situation has been particularly acute for consumers on the West Coast where to a large extent fabricators are dependent on eastern mills for supplies.

STEEL's composite price averages reflect the changes which have occurred in the market over the year. At the yearend the finished steel index stood at $64.91 compared with $58.27 a year ago; semifinished at $41.60 against $37.80; steelmaking pig iron at $29.56 compared with $24.75, and steelmaking scrap at $31.08 against $19.17.

Final accounting for 1946 is not completed, but indications are the steel industry's earnings position improved during the year as compared with 1945. For the first nine months net income of 21 producers representing 85.8 per cent of the nation's ingot capacity totaled $163,945,137, which compared with $118,271,621 in the corresponding period of 1945. Contributing to the improved showing was freedom from federal excess profit taxes.

Each of the 21 producers reported a net profit in the third quarter of the year, whereas one had shown a loss in the second quarter. However, eight of them had lower net profit in the third period than they had in the second three months. All 21 had greater profits in the third quarter than they had in the like period of 1945. In the first quarter of 1946 eight reported losses.

Cost Factor Paramount

Continuance of the favorable showing in earnings into 1947 will depend on cost factors not yet determinable. Although wages in the industry last year rose to the highest level in history, the steelworkers' union currently is driving for a further wage boost, late in December hinting an increase of at least 20 cents per hour would be sought when existing contracts with the steel companies expire in February. In some quarters the view has been expressed that the yearend increases in steel prices were effected by the producers anticipatory of the union's wage demands. This, however, is pure speculation and in view of other prospective cost increases, such as the freight rate increase averaging 17.6 per cent which became effective Jan. 1, it is questionable if the December price boosts will be sufficient to cover the added cost burdens facing the industry.

Steel industry employment hit a postwar peak in the late months of 1946, averaging in September and October 595,700. Wage earners in the industry averaged 40.3 hours per week in October,

while average hourly wages amounted to 134.1 cents, well above the rate paid in 1945. Through the first 10 months of 1946 the industry paid out in wages a total of $1,263,484,800.

Materials shortages as well as labor difficulties handicapped the steelmakers in pushing their 1946 plant expansion and rehabilitation programs to completion. At the opening of the year plans had been projected for record-breaking facility expenditures of $327 million to provide the equipment deemed necessary to meet anticipated postwar steel demands. Most of the expansion was projected in new and improved rolling mills and finishing facilities. Because of the wartime expansion in blast furnace and steelmaking facilities relatively little new construction in those departments was scheduled. Steel ingot capacity in 1946 was rated at 91,890,540 tons, and blast furnace capacity at 67,340,590 tons.

As the new year opens considerable new capacity for production of hot and cold-rolled sheets and strip is under construction and will come into production before many months. Last year capacity for producing this class of product was greater than in 1941. Since July of 1941, more new sheet and strip producing facilities have been added than have been dismantled. The net effect has been to increase sheet and strip capacity, as of the present, about 1 million tons above the 1941 level. Indications now are that by mid-1947 additional rolling mills, with capacity in excess of 2,500,000 tons, will be in production or nearing completion. Still further additions are projected for completion sometime in 1948.

Automakers Hoping for Better Year in 1947

(*Continued from Page* 198)

General Motors, for example, generally considered to be amply buttressed financially to weather any economic storm, last year felt it necessary to borrow $125 million from a group of insurance companies, and later to issue a new 3.75 per cent preferred stock calculated to raise another $100 million. Beyond that, numerous major plant expansion programs were deferred or suspended, including the $100 million Chevrolet light car project in Cleveland, a $10 million technical center at Detroit and other lesser projects.

Ford was faced with a similar retrenchment, after totaling the ledgers and discovering a nine-month loss, before tax carrybacks of $51.6 million, or the equivalent of about $80 on every car and truck produced up to Sept. 30. The discovery was no particular surprise to the management, for it told union nego-

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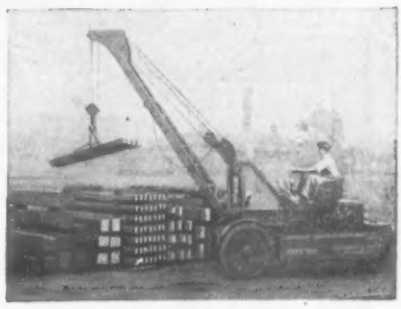

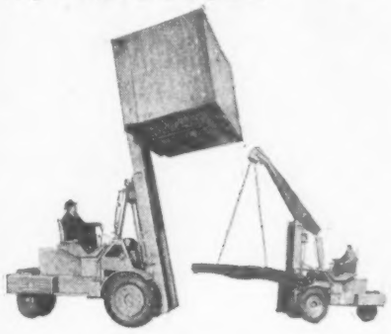

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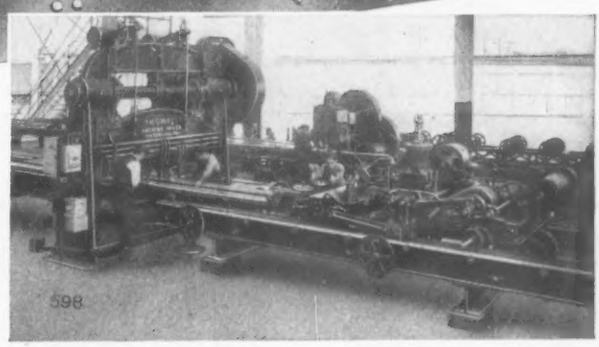

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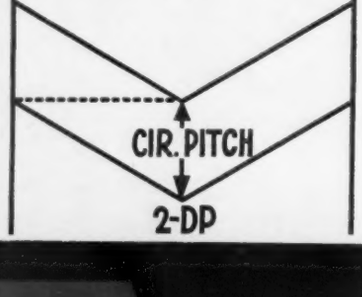

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tiators after granting a wage increase last spring, that the result would be a $35 million loss for the year, which is just about what the 12-month record will show.

Administrative reorganization of the Ford Motor Co., beginning in 1945, was continued at an accelerated pace last year and appears now to have been practically completed. Appointment of E. R. Breech, former General Motors, North American Aviation and Bendix Aviation official, as executive vice president was followed by the induction of a number of the "younger, dynamic" type of automobile engineers and executives, many of them formerly high in the General Motors family, into top posts at the Rouge plant. Thus Harold Youngren, credited with a major role in development of the Oldsmobile Hydra-Matic transmission and more recently in charge of engineering development at Borg-Warner, became chief engineer. D. S. Harder, a top Fisher Body production chief and later head of E. W. Bliss Co., became vice president in charge of operations. L. D. Crusoe, former comptroller at Fisher Body, became vice president in charge of planning and control. And so on down the line.

Company Revitalization Planned

Conclusion is inescapable that the Ford family is determined to staff its organization with a corps of ace administrators capable of revitalizing the company, restyling the product, re-engineering it from the ground up and pushing ahead with a merchandising program which, if it does not again bring Ford to the top rung of the automotive ladder, at least will have been the maximum effort possible within the limits of men and money.

A number of bold steps have been taken by the management along this road. First the company has divorced itself from practically all so-called nonprofit enterprises undertaken in the past by the elder Mr. Ford, and has sold most if not all of the Ford "village industries." Second, it dropped immediate plans for a low-price car originally announced as a competitor to the Chevrolet light car. Third, it divorced tractor production and distribution from the Harry Ferguson organization and set up a new Dearborn Motors Co. to handle these operations, under direction of a former General Motors vice president. Also announced during the year was a vast research center to be built near the Rouge plant in which all phases of production, merchandising and human research would come in for study. The latter, designed as a permanent tribute to the genius of Henry Ford, has been temporarily delayed because of unsettled financial and building conditions.

Many other lesser steps taken in the

Ford rehabilitation bear the earmarks of efforts to make the business function in line with the ablest contemporary financial and planning concepts, and to strengthen engineering, purchasing and production control activity in the Ford organization.

First year of production by Kaiser-Frazer Corp. was fraught with most of the troubles besetting other producers. Material bottlenecks, unanticipated high costs and a hundred and one production "bugs" upset original planning, but by year-end assemblies were moving at a rate of about 200 per day, and total for the year probably will figure to something like 12,000, with two-thirds of these produced in the past two months.

The originally planned front wheel drive Kaiser model was abandoned because of unsolved engineering problems, and a substitute Kaiser Special evolved by slightly modifying the Frazer design. Retail prices on the two cars were well beyond their planned level of $1000 and $1500, the Kaiser selling at around $1700 and the Frazer at $2100. Dealer order books were still crammed, however, and as the year closed, company officials continued to talk hopefully of assembling 1500 daily. An assembly plant at Long Beach, Calif., is being groomed for production of Kaiser Specials and such other automotive creations as the elder Henry Kaiser may have in mind.

Willys' Organization Active

A considerable reshuffling of the Willys-Overland organization in Toledo took place during the year under direction of James D. Mooney, former head of the General Motors Overseas Division and an ardent believer in economy and utility as watchwords in motor car design. An extensive financing program was undertaken to re-equip present plants and to acquire others. The peacetime version of the Willys jeep continued in fair production volume, and a station wagon with numerous refinements and built on essentially the jeep chassis was introduced. Already engineered but not tooled is a small 6-cylinder passenger car with which the company hopes to capture a fair share of the volume market. In December, Willys announced it was resuming production of spare parts for military jeeps after surveys showed 400,000 of an estimated 650,000 produced during the war still in operation in various remote places around the world.

Mix a dash of congenital optimism with a dash of realism, add a dash of increasing cost consciousness, a few drops of worry over materials and labor, stir night and day, and pour over a market which no one concedes will diminish one whit in the next 12 months—there you have the automotive table d'hote for 1947.

When welders can swing tons of weldment into any position for the next downhand pass quickly and safely, with a touch on the push button control, they are able to work better, faster and more economically, no matter what the job. Interruptions in any welding operation are costly—when welders or their helpers must prop up, flop, turn over, crawl under, over and around weldments, they are adding costs to the job. Because more and more welding is being done in today's production, it is important that your welding costs and quality be examined in the light of economies and improvements made possible by C-F Positioners.

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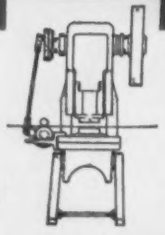

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(*Continued from Page 278*)

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Advocates Keeping War Tools As National Security Measure

George Hubight Jr., president and treasurer, Marshall & Huschart Machinery Co., Chicago, and president, American Machine Tool Distributor's Association: "For a long time, I have advocated and suggested that the government retain about 50 per cent of all the machine tools which they acquired during the war and probably a larger percentage of the large critical machine tools which are so urgently needed in time of war and which normally take from 6 to 12 months to produce.

"Everyone agrees that if there is another war, we will not have time to equip plants to produce war materiel, which equipment would have to be produced by the machine tool builders. I refer to such machines as large vertical boring mills, horizontal boring machines, planers and planer type milling machines, heavy gear cutting machines and hobbing machines, gun turning, boring and rifling machines, shell forging and turning equipment, highly specialized equipment for shell loading, and specialized fuse manufacturing equipment. To these should be added about 40 per cent of the latest type standard machine tools, of all kinds needed for war work, aircraft engines.

"A real far-thinking plan would be to keep pilot lines set up within the plants of our large industrial manufacturers, so that the know-how and methods of producing war materiel will not be lost or forgotten. All records of advanced manufacturing processes for producing war materiel should be maintained in the files of the various military establishments so that we could educate a new group of industrialists in the manufac-

ture of these items for such an occasion.

"We should not only retain this machine tool equipment as national security insurance, but we should do it to help protect the machine tool industry, which is of vital importance to the security of the country in time of war.

"We of the machine tool industry, and particularly those who gave of their time in co-operation with our government during the past great war, in correlating the efforts of the machine tool industry of this country with the requirements of our armed forces and industry itself, know only too well and appreciate the necessity and vital importance of a very soundy established machine tool industry.

"It therefore is regrettable that such an industry, which so ably demonstrated its importance in such a crisis and which looms still more important in the future economic struggle of this country, should be so quickly forgotten as to be neglected in the administration of the planning and disposition of the tremendous stock piles of machine tools acquired by our government, especially when such a disposal can affect the stability of this important industry adversely.

"Modern war and defense have outgrown the confines of our government departments with their relatively small peacetime personnel, and we have found that a close working contact with science and industry, produced the magnificent results that everyone is now aware of.

"To keep this arrangement active and healthy, it would seem that a program of retention of government owned machine tools for use by all its various agencies and the equipping of our educational institutions with modern equipment to stimulate a much greater enthusiasm in the field of mechanical development, would be of greater benefit to our future welfare than to allow a 'helter skelter' disposition of this huge stock pile of machine tools at prices that are a distinct loss to our government and a threat to the stability of this important industry."

Cast Alloy Cutting Materials Step Up Older Machines' Output

W. A. Marquard Sr., engineer, headquarters manufacturing, engineering department, Westinghouse Electric Corp., East Pittsburgh, Pa.: "The recently developed cast alloy cutting materials make possible increased feeds and speeds with older

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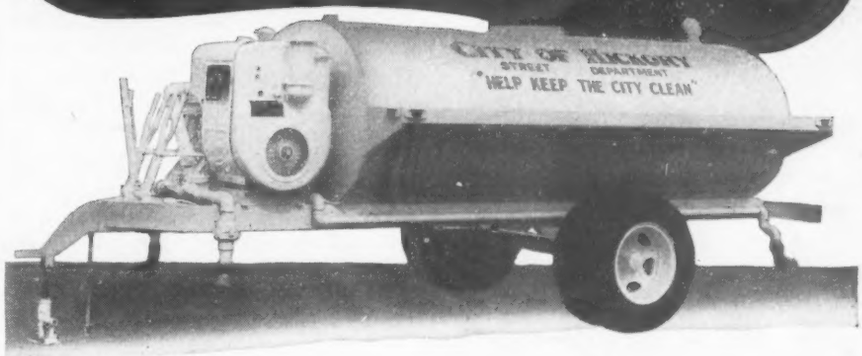

The Model VE4 Wisconsin Air-Cooled Power Unit which supplies dependable power for the "City of Hickory" street flusher, made by Gunnison Manufacturing Co., of Baraboo, Wis., conforms in every detail to the clean-cut, streamlined beauty of the equipment of which it is an integral part. Delivering 20 hp. at 2200 R.P.M., this Wisconsin Engine provides steady-going, heavy-duty serviceability and ample power for the job . . . and it fits the equipment with "tailor-made" nicety. If YOU have a problem in connection with your equipment, calling for self-contained engine power within a 2 to 30 hp. range, you may find a ready solution in the Wisconsin Air-Cooled Engine line. Detailed data on request.

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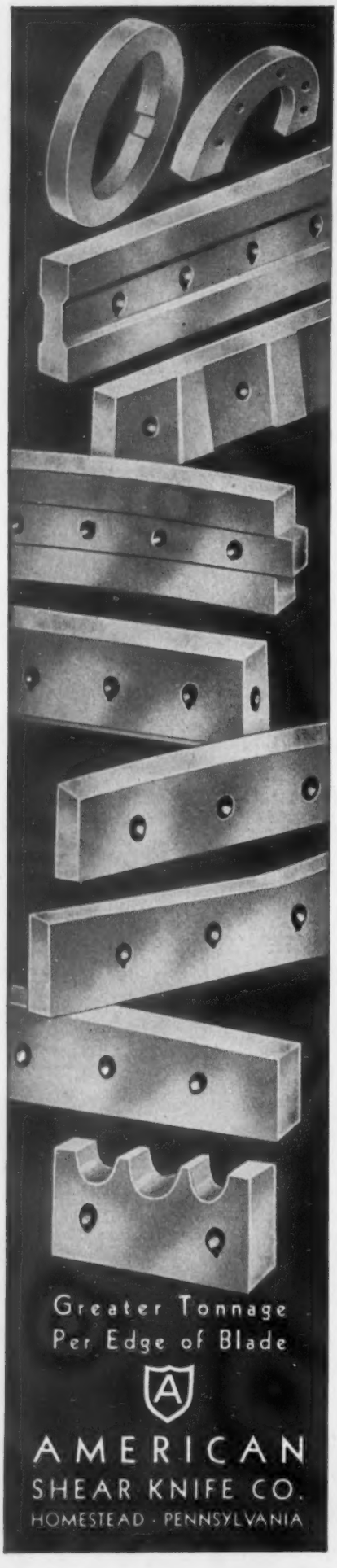

machine tools without imposing strains and stresses beyond structural limitations. Feeds and speeds obtained are twice as great as those with high speed tool steel while the life between grinds is of the order of 5 to 1.

"Cast alloy is not nearly as brittle and does not chip as easily as sintered carbides. One grade will usually suffice for all conditions and materials in regard to removing metal. The inventory of tools carried in stock is thus reduced.

"The alloy can be cast into practically any shape. It has been successfully applied to dies, milling cutters, counterbores, drills, single point cutting tools, etc. It lends itself to all types of machining (except tapping) where odd and intricate shapes of cutting tools are required.

"The time required to machine cast alloy is approximately 100 percent greater than that for machining high speed tool steel, but the grinding time is less for it is possible to machine to closer tolerances. This material can be used to great advantage in building punching dies as it can be machined to shape and the hazard of distortion or cracking when heat treated is eliminated."

Welding Alloy Has High Strength, Low Melt Point

A silver welding alloy said to be capable of providing high strength welds on ferrous and nonferrous metals at a low melting point is announced by Eutectic Welding Alloys Corp., New York. Known as EutecRod 1801, the alloy may be applied by oxyacetylene, torch, furnace or high frequency induction heating equipment.

Bonding at base metal temperatures of 940 to 1120° F and melting at 1143° F, alloy flows freely into close-fitting joints at these temperatures. Deposits are said to have a shear strength of 120,000 psi, and provide good corrosion resistance and electrical conductivity.

Drafting Instrument Makes Isometric Drawings

A new line of stencil type drafting instruments said to make isometric or dimetric drawings efficiently is being manufactured by Instrumaster Industries, 7395 Arch street, Greenwich, Conn. Made of 0.040-in. plastic, both models offered have graduations and lettering debossed on lower side.

Each stencil has 27 ellipse openings which are claimed to represent circles from 1/8 to 2 in. dia. in individual projections. It is stated that allowance is made for pencil point or lettering pen thickness.

General Purpose, Mild Steel Electrode Offered

Especially suited for low-cost, single or multiple-pass welding on plates or sections where the fit-up is poor or the work is rusty or dirty, a new general purpose, mild steel electrode developed by Air Reduction Sales Co., New York, is reported to operate equally well on direct current straight or reverse polarity and on alternating current. It also produces weld metal of high mechanical properties.

The extruded Airco No. 87 electrode produces good welds over wide current ranges and, according to the company, it provides a higher deposition rate.

Light Weight Steel Pallets Announced

Pallets standardized in size to fit into railroad and truck equipment as well as storage facilities and built for material handling truck operations are being produced by Monroe Auto Equipment Co., Monroe, Mich. Made of high tensile steel, they are designed to fit shipping requirements of modern packages, most of which have at least one dimension of 12, 24 or 48 in. to give easier and more compact pallet loading.

Recent tests of the load bearing capacities of the pallets prove them capable of withstanding more than 100,000 lb when tiered, the company states.

Descaling Equipment

Equipment and process requirements for sodium hydride descaling are described in detail in the new booklet issued by A. F. Holden Co., New Haven, Conn. Applications of the process, its features and advantages and the chemical basis of the process are covered.

Also included is information on the bath, generation of sodium hydride, operation and cost characteristics. Various types of furnaces, auxiliary equipment, cold water quenching tanks, conveyor equipment and controls also are discussed.

Steel marking tools and dies are now supplied with a glossy black finish as a protective coating which prevents deterioration and corrosion, according to Wm. A. Force & Co., Brooklyn 8. A transparent plastic coating is also used to protect against accidental marring of the face of the engraved characters before use.

Electric Power Facilities To Be Increased

TO KEEP abreast of increasing usage of electricity, the electric utility industry plans to add 8½ million kilowatts of generating capacity in the next three years.

Largely because of strikes in the metal-producing industries and in the plants of principal electrical manufacturers, barely 150,000 of the 1,400,000 kilowatts of generating capacity scheduled for installation in 1946 actually went into service during the year. On the other hand, the maximum demands on the generating stations are estimated to have increased by some 4,700,000 kilowatts and the margin of spare and reserve capacity, which stood at 9,300,000 (or 23 per cent of peak requirements) in December, 1945, has been reduced to 4,750,000 kilowatts, or only 10 per cent.

However, the electric companies plan to add about 2,400,000 kilowatts in generating capacity in 1947, with 3,500,000 kilowatts to follow in 1948. Already about 1,750,000 kilowatts are ordered for 1949, with more for that year expected to follow.

Last year was one of phenomenal growth in the number of customers served by the electric utility industry, Grover C. Neff, president, Edison Electric Institute, New York, said. Despite the housing shortage and difficulties encountered in procuring poles, wire and equipment, nearly two million new customers were added. A backlog of 600,000 applicants for service indicates that 1947 will match 1946 in new customers added, Mr. Neff pointed out.

Production of electricity last year was estimated at 222,500,000,000 kilowatt-hours, approximately the same as the 222,433,981,000 generated in 1945.

Good Demand for Electrical Controls Expected in 1947

Demand for electrical controls continues sufficiently great that the Square D Co., Detroit, will continue in 1947 to expand and to seek increased production efficiency, F. W. Magin, president, announced last week.

At the end of 1946, Square D had not reached the peak production that had been anticipated. Although the company expects output to continue upward it also looks for demand to outrun production gains, and said Mr. Magin, "Our aim for the year ahead is to fulfill more of the demands made upon our industry so that electrical apparatus such as we make will not be lacking and deter production of the many end-use products."

One of the electrical apparatus industry's large markets, Mr. Magin said, is in connection with factory construction and installation of machine tools. In this use, the demand has been for new controls, circuit breakers, and switches that operate more efficiently and that do a bigger job than their prewar models.

Building of homes, schools, churches and farm buildings also will create additional demands for electrical materials, Mr. Magin pointed out.

OBITUARIES . . .

Albert H. Reeves, 66, a director of the Reeves Steel & Mfg. Co., Dover, O., died Dec. 24. He had retired as general superintendent of the firm 10 years ago.

—o—

Sydney G. McAllister, 67, chairman of the executive committee and retired president, International Harvester Co., Chicago, died Dec. 25 in Pasadena, Calif. He joined the company in 1897 as an office boy in the McCormick works and rose through the manufacturing department to serve successively as superintendent of the Auburn, N. Y., works; inspector-general of European manufacturing; director of European manufacturing; vice-president in charge of engineering, patents, fiber and traffic; and president 1935 to 1940, when he retired. Mr. McAllister was a director of Crane Co. and Illinois Institute of Technology.

—o—

George Edward Neuberth, 78, retired inventor and engineering consultant, died Dec. 24 at his home in Newark, N. J. Among his inventions was a metal furniture caster and a machine for producing it. He founded the Neuberth Tube Area Reducing Machine Co. Until his retirement six years ago he was supervisor and consultant at Tube Reducing Corp. of America, Wallington, N. J.

—o—

W. Rowland Cox, 74, retired mining engineer, died Dec. 24 in Englewood, N. J.

—o—

Harry J. Bonham, retired California industrialist, died recently at Hanford, Calif. Until his retirement in 1944 he operated the Bonham Iron Works, Riverside, Calif.

—o—

Fred L. Pomeroy, 65, traffic manager of the Vanadium Corp. of America, New York, died recently following a heart attack at his home in Westfield, N. J

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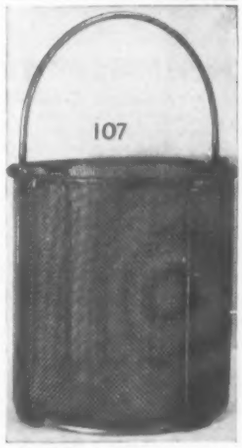

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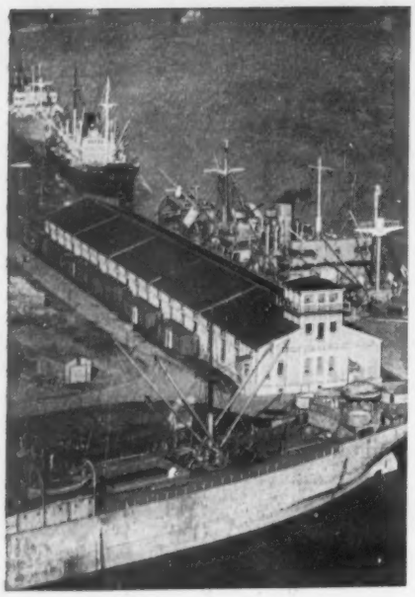

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WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

Construction Becomes Leading Outlet for Aluminum Products

Light metal, spurred by phenomenal wartime demand and consequent postwar acceptance, now ranks as No. 2 metal of industry in volume. Capacity more than four times as great as prewar and exceeds billion pounds annually

PHENOMENAL wartime demand and the resulting postwar acceptance of aluminum have boosted it to a position as the second-ranking metal of peacetime industry, in terms of volume produced. Only iron and steel are produced in larger volume, according to George R. Gibbons, vice president, Aluminum Co. of America.

Also significant has been the marked shift of emphasis in demand for aluminum in 1946, with architectural and building applications soaring upward to replace transportation at the moment, as the field requiring the largest percentage of this lightweight metal.

A mark of aluminum's rapid growth to maturity in the peacetime family of metals is the fact that the nation's economical capacity for producing new aluminum is at present four times as great as in the highest prewar year, and amounts to well over one billion pounds per year. During 1946, nearly all of the war-built, government-owned aluminum plants capable of economical peacetime operations were leased or sold to private industry. There are now three major producers serving the nation as sources of new aluminum metal. Each of these producers is independent, privately owned, and largely integrated. In addition, hundreds of manufacturers throughout the country became fabricators of aluminum products during and since the war.

Near Capacity Output Expected

Production of new aluminum in the United States in 1946 totaled about 836 million pounds. While this is almost three times as much as was produced by the nation in 1938, it represents only about two-thirds of the rated annual capacity which is now approaching full production. The lag was caused primarily by reconversion problems incident to disposal of government-owned plants and readying these facilities for peacetime operation. It is probable that near-capacity production will develop in 1947, the Civilian Production Administration having recently estimated that actual production of new aluminum this year may approximate 1,260,000,000 pounds.

Aluminum Co. of America, says Mr. Gibbons, "has been guided by the diversity of present and anticipated demand in projecting its plans for the future, and is doing its part to promote the most desirable balance of the nation's overal economy. In recent months Alcoa has begun the re-adaptation of its facilities to the demands of peacetime markets, since many of the facilities operated during the war were primarily designed for production of special materials peculiar to wartime needs.

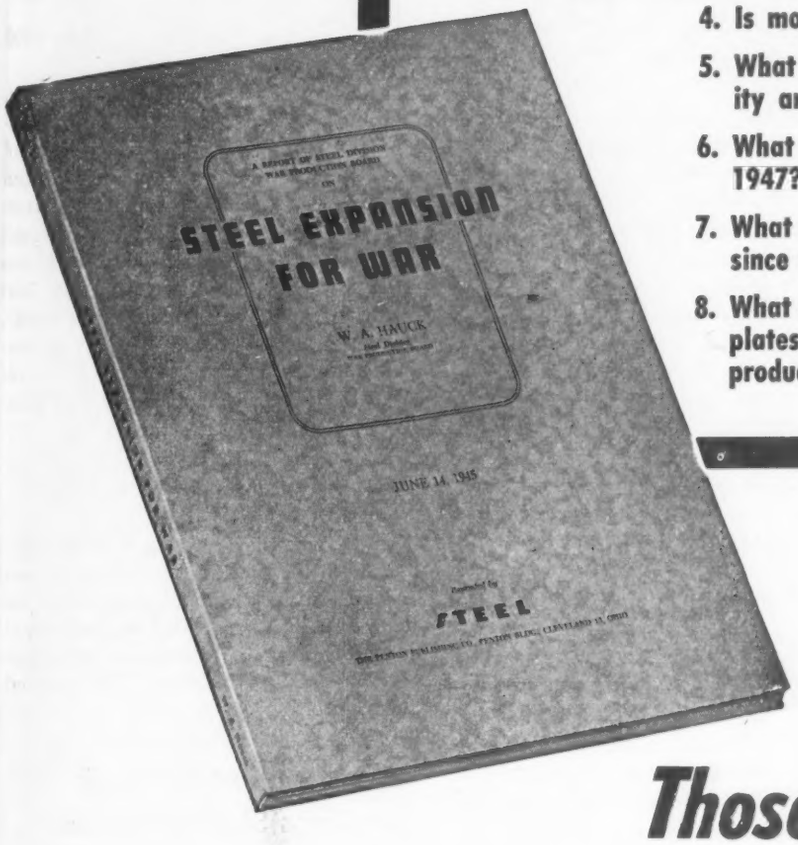
"Among the outstanding applications, new and old, which are creating the present tremendous demand for aluminum in the architectural and building field are: Corrugated aluminum sheet for farm and industrial roofing and siding; metalclad buildings; prefabricated residential and other building; residential garage doors; heating and ventilating ducts; architectural trim and fixtures; lightning rods and conductors; windows, storm sash and screens; venetian blinds; metal awnings; nails; hardware; and numerous other uses. There has been a particularly great increase in the use of aluminum for residential windows. Prior to the war this use was mainly experimental. During 1946 more than 500,000 such windows were manufactured, and the prospects for 1947 indicate the probable manufacture of well over 2,000,000.

"In transportation, aluminum construction now predominates in the light plane field. Thousands of aluminum canoes, rowboats, and sailboats are being produced and sold. Large quantities of the metal are being used in the superstructures of passenger and cargo ships, for lifeboats, and in ships' interior partitions. Truck, trailer, and bus manufacturers are using more aluminum, particularly in body and axle construction. There is an expanding market for automotive and diesel pistons, and the use of aluminum for bearings and bushings is making steady progress. At least 12 states will be using aluminum license plates for automobiles in 1947-1948.

"A number of new all-aluminum streamlined trains, passenger cars, tank

STEEL CAPACITY?

1. How much steelmaking capacity was added during the war?
2. How much money was spent? Where are the plants located?
3. What is steelmaking capacity today?
4. Is more capacity needed?
5. What has been the long-term trend in capacity and production?
6. What will sheet and strip capacity be in 1947?
7. What new finishing capacity has been added since the war?
8. What companies make the sheets, strip, bars, plates, shapes, pipe, wire and other finished products you need today?



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AN OFFICIAL REPORT

Prepared by W. A. Hauck who was closely associated with the steel expansion program all through the war as a top executive of the Steel Division of the War Production Board and now is in charge of steel plant disposal for the War Assets Administration.

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cars and hopper cars are now in railroad service, and others are under construction. An experimental all-aluminum refrigerator car, designed with the help of Alcoa engineers, is now making regular runs and attracting much favorable attention.

"The electrical manufacturing industry is consuming an increasingly important tonnage of aluminum. Outstanding is the use of aluminum for electrical conductors, particularly in the field of building wire, which is showing tremendous growth and meeting widespread acceptance.

"Considerable amounts of aluminum are being used for irrigation pipe, and a large potential market lies in use of the metal for cathodic protection of steel tanks, pipe lines, and structures.

"Postwar domestic refrigerators will probably average five times as much aluminum per unit as prewar models. Home freezers offer another substantial outlet. A surprisingly large quantity of aluminum is going into such items as clothesline wire, clothes pins, cigarette lighters, toothpaste and shaving cream tubes, milk bottle caps, and into foil packaging for drugs, foods, cigarets, and similar products."

Steel Earnings Bring Less Than 5 Per Cent Return

Of the 468,200 individuals holding common and preferred stock of companies in the steel industry, 232,500 are women, according to the American Iron & Steel Institute. Male stockholders total 235,000, and in addition, there are 47,900 institutions, businesses and other groups owning a share of the industry. Individual stockholders held 60.0 per cent of the industry's stock, while 9.0 per cent was held by institutions, including insurance companies, hospitals, colleges, churches, charities, foundations and estates. Other groups, including small and large businesses, investment trusts, foreign corporations, brokerage houses, and so on, held 31.0 per cent of steel shares.

Altogether, these various groups and individuals hold the bulk of the $4,500,000,000 investment comprising the nation's blast furnaces, open hearths, rolling mills, by-product plants, iron ore mines, lake shipping and numerous bituminous coal mines. Their interest is subject to $472,500,000 in long-term debt owed by the companies comprising the industry. This investment in 1945 created employment for 773,419 people in the steel industry and its corollary activities.

Steel operations in 1945 resulted in earnings of $179,653,823, which represented less than 5 per cent return to the owners of the industry for their investment. For every dollar of dividends paid to the owners of the industry in 1945, employees in the industry were paid $16.50 in the form of salaries and wages. The average for all businesses is $7 to wage earners for every dollar paid out to investors. If the dividends paid to steel stockholders for the years from 1934 through 1945 were combined, the total would be only one-half of last year's payroll.

Over 26 Per Cent of Steel Firms' Employees Are Vets

Ex-servicemen on the payrolls of 32 iron and steel companies, as of the end of July, accounted for 26.7 per cent of total employment at that time, American Iron & Steel Institute, New York, has reported. The total number of such employees was 137,318.

A total of 205,826 veterans of World War II had been employed by the surveyed companies up to the end of July. Of this number 97,069 were new employees of the companies, the institute announced.

Of the veterans now on steel industry payrolls, the institute found, only one out of each 81 required special job placement by the medical and personnel departments of the companies because of mental or physical disabilities acquired in service.

Electric Industrial Truck Bookings Show Increase

Domestic bookings for electric industrial trucks and tractors in October exceeded the September bookings both in units and money value, the Electric Industrial Truck Association, Chicago, reported.

October bookings were for 267 units, the chassis value of which was $1,219,469. In September, 219 units were booked, and the chassis value was $928,367.

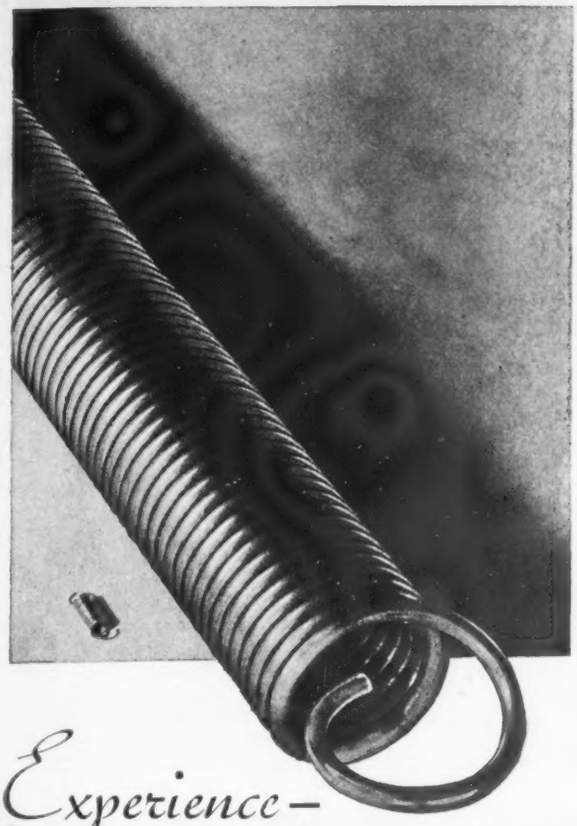
Los Angeles Population Gains 1.35% in Quarter

Los Angeles County population: 3,703,903; Los Angeles city population: 1,877,811. Such are the census estimates issued last week by the Los Angeles County Regional Planning Commission.

Total county growth since 1940 was 918,260. City gains are put at 373,534.

During the third quarter of 1946 percentage of increase countywise was 1.78. Increase for Los Angeles city was 1.35 per cent.

SPRINGS by LEE



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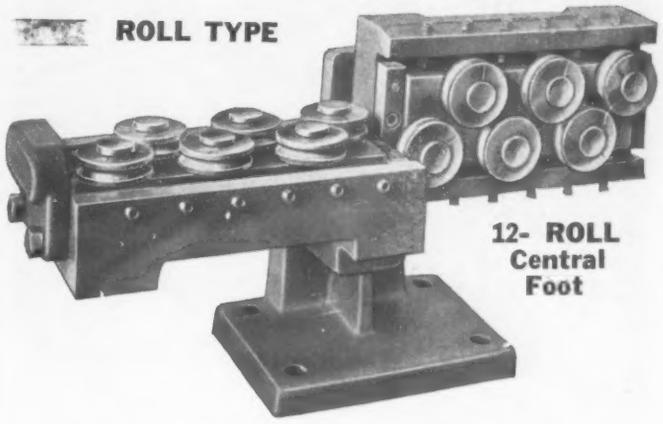

12- ROLL Central Foot

The Roll Type shown above is generally used with automatic machines. The wire is drawn through the straightener to remove the natural curve and put it into better shape for the forming dies. Made in sizes from 1/16" to ½".

The Rotary machine shown below has no feeding attachment. The wire is pulled through mechanically while the head revolves at high speed. Made in sizes from 1/16" to 3/8".

In the case of either of these machines, the size indicates the maximum diameter of wire that can be handled, but several smaller sizes can also be worked.

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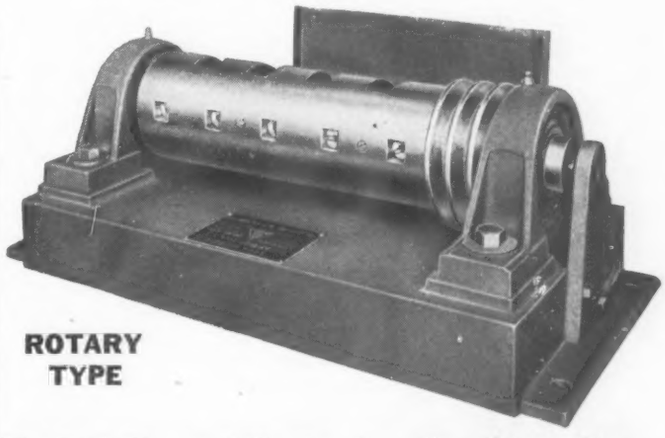

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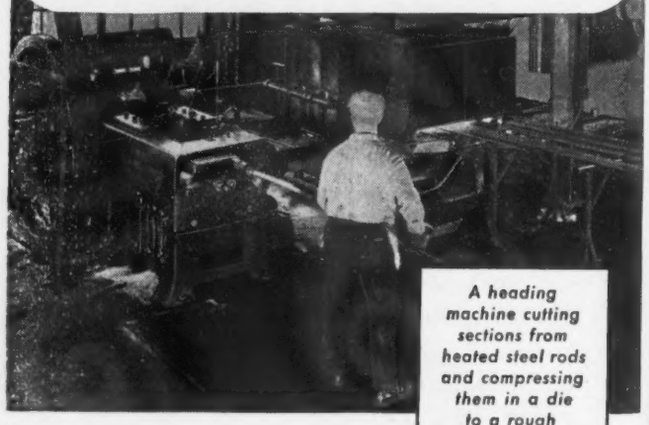

A heading machine cutting sections from heated steel rods and compressing them in a die to a rough spherical shape

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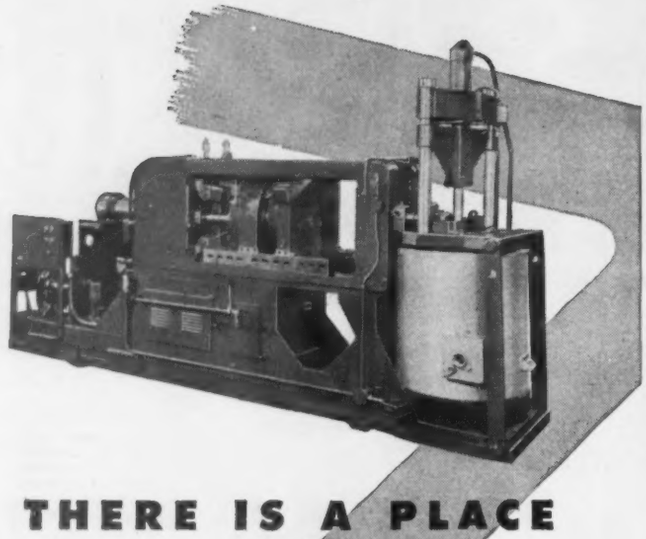

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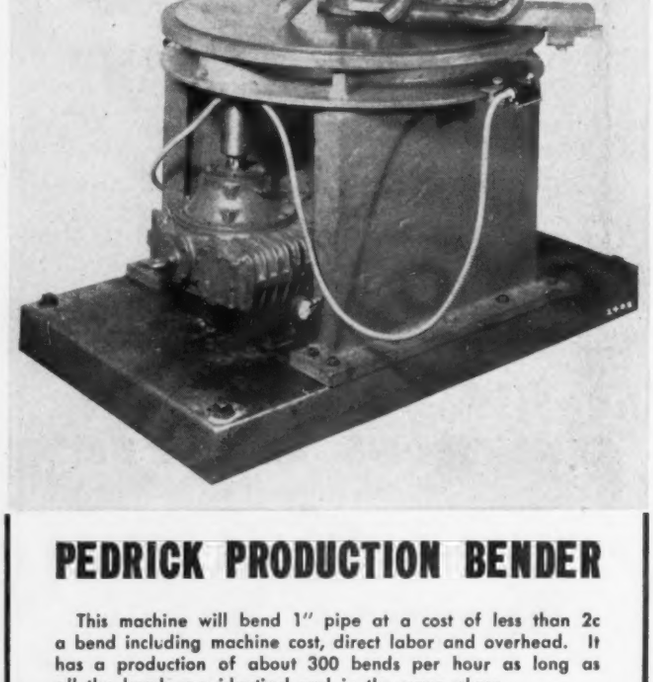

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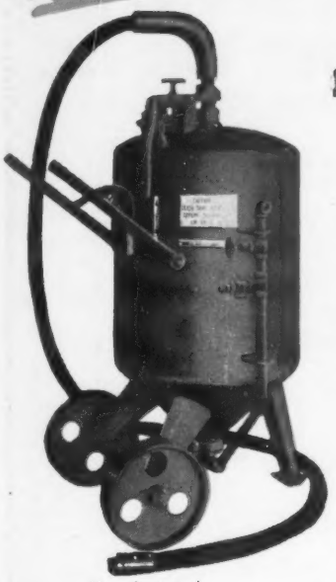

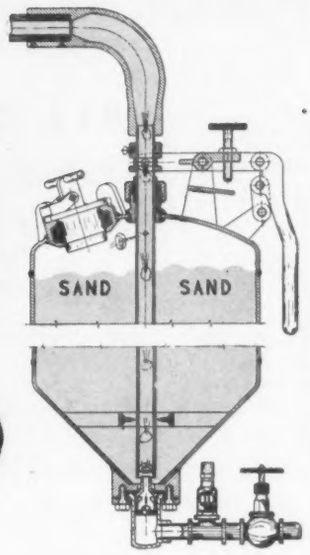

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5/16" x 1/4"	1/2" x 9/32"	1/2" x 9/32"	11/32" x 7/32"	11/32"	1/4"
5/16" x 3/16"	1/2" x 3/16"	1/2" x 7/32"	5/16" x 1/4"	21/64"	7/32"
1/4" x 3/16"	1/2" x 5/32"	1/2" x 3/16"	5/16" x 9/64"	5/16"	3/16"
	13/32" x 9/32"	1/2" x 5/32"	9/32" x 7/32"	9/32"	5/32"
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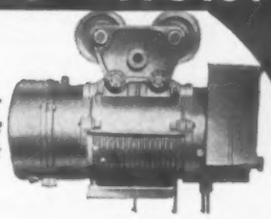

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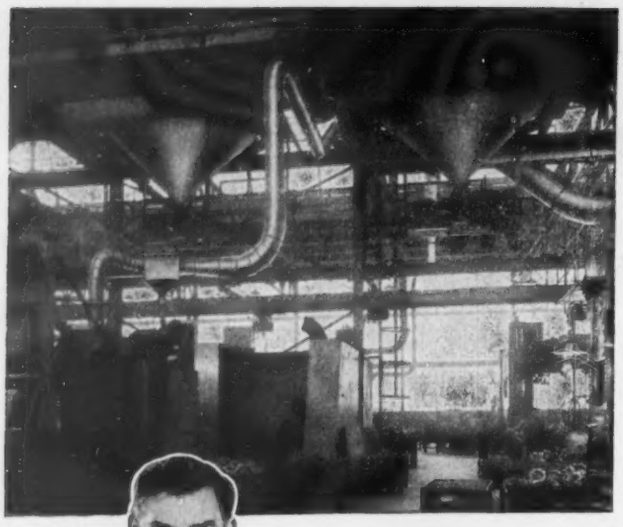

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Are your *dust control problems* different from those of any other plant or even any other industry you know of?

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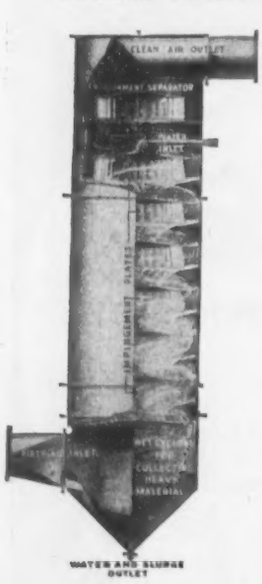

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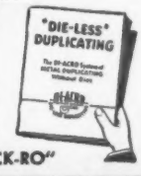

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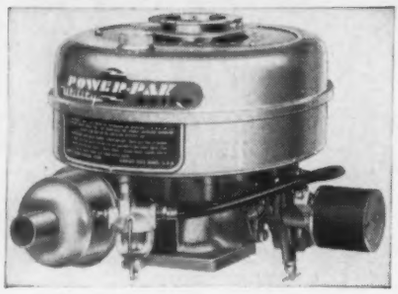

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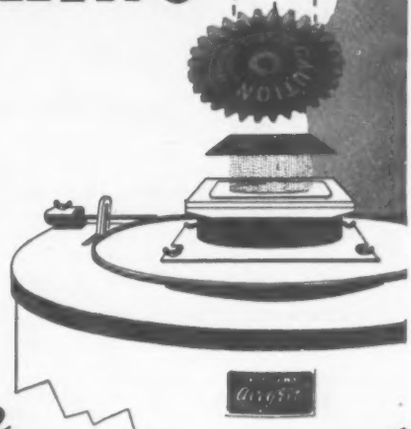

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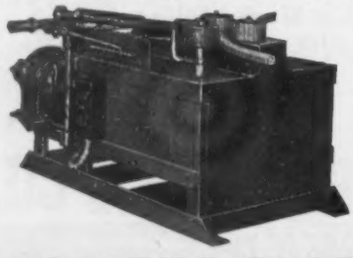

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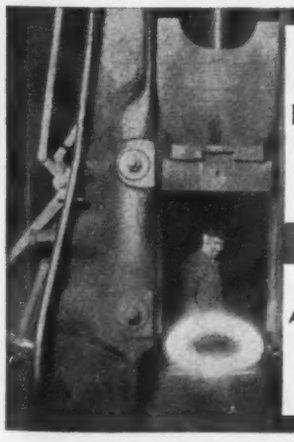

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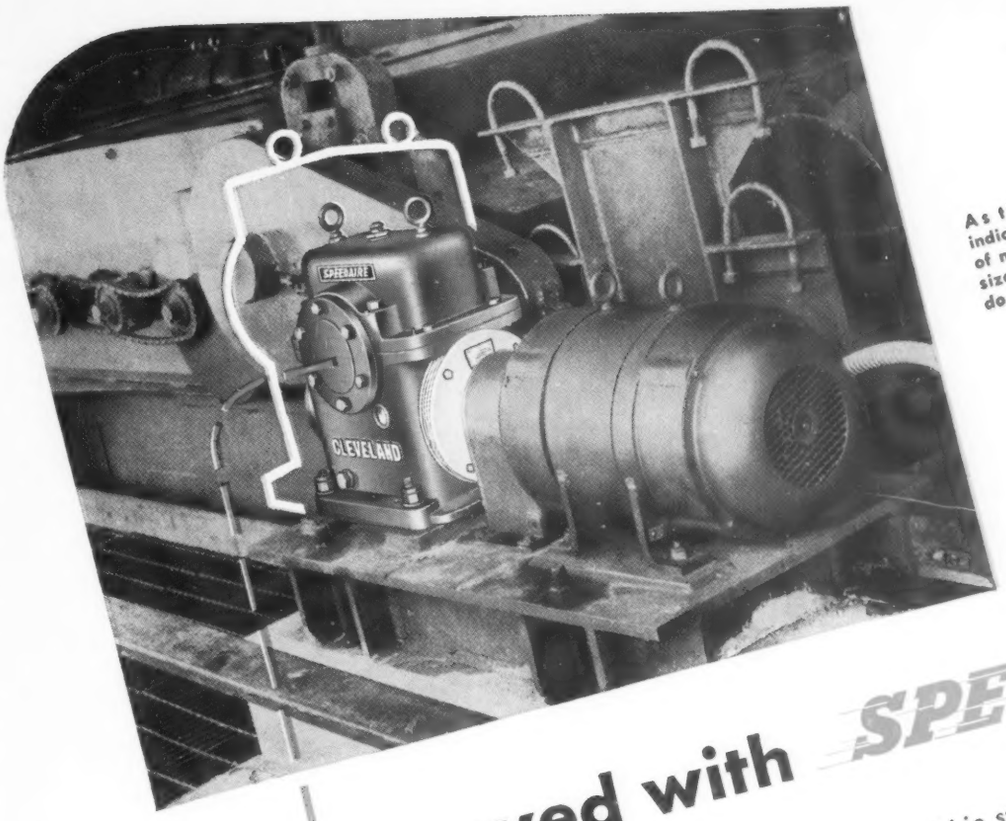


As the white outline indicates, a standard unit of nearly twice the frame size would be required to do the work of Speedaire.

28% of cost saved with SPEEDAIRE

THIS Speedaire is installed in a well-known Ohio steel mill. It drives the rolls of a pickler through which steel sheets pass before hot dip galvanizing.

In selecting Speedaire for this job, the company saved three ways: It *saved dollars*—28% of the cost of a standard worm-gear speed reducer. It *saved weight*—36.6% of the floor load. And it *saved space*—50% of the room required to accommodate a conventional unit.

Speedaire is Cleveland's new fan-cooled worm-gear speed reducer. Because it is fan-cooled, Speedaire will do more work—will deliver up to *double the horsepower* of standard worm units of equal frame size, at usual motor speeds. It can be installed economically on many applications where other types have been used heretofore—giving you the advantages of a compact right-angle drive. Speedaire gives the same long, trouble-free service characteristic of all Clevelands.

For full description, send for Catalog 300. The Cleveland Worm & Gear Co., 3270 East 80th St., Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

CLEVELAND
Worm Gear
Speed Reducers

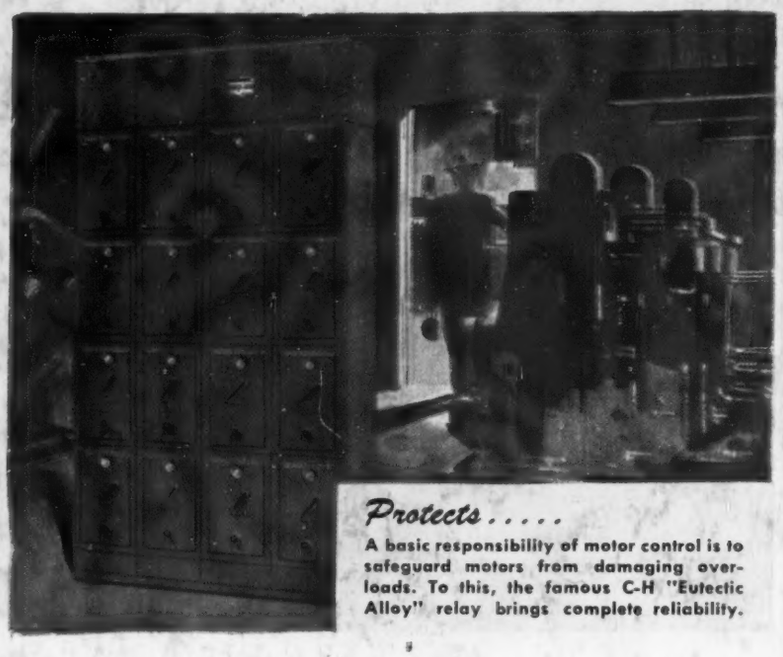
Bettered by Basic Engineering

Starts & Stops . . . . .

The primary function of any motor control is to properly and safely start and stop electric motors. To this, the famous C-H "Vertical Contact" design in the motor control brings trouble-free dependability.

Regulates . . . . .

Precise speed control is vital. To this, such C-H engineering achievements as "Inductive Time Limit", "ac Dynamic "and "Ultraflex" electronic control bring practical perfection.



Protects . . . . .

A basic responsibility of motor control is to safeguard motors from damaging overloads. To this, the famous C-H "Eutectic Alloy" relay brings complete reliability.

America's millions of electric motors do every conceivable type of work from pumping water on farms to driving skillfully coordinated groups of machines in the most complex of industrial processes. Some of these motors, obviously, must be supervised and protected by elaborate and highly specialized control systems. Others need only simple and relatively inexpensive control equipment. But it must be equally obvious that the performance of *each* motor is a vital matter regardless of its particular assignment, its size, or its cost . . . that dependable motor control is *always* a prime necessity.

Cutler-Hammer Motor Control has won such universal preference because it is the product of not only the most extensive specialized motor control experience but the most intensive *basic* engineering. Many of the outstanding examples of Cutler-Hammer engineering leadership improve the *fundamental* functions of motor control. Motors are made to start and stop *dependably*. Speed control is accurate and uniformly *reliable*. Overload protection is both precise and *positive*. It pays to specify Cutler-Hammer Motor Control and refuse all substitutes. CUTLER-HAMMER, Inc., 1211 St. Paul Avenue, Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto.

CUTLER-HAMMER
MOTOR CONTROL
C-H